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ABSTRACT

The aim of the conference on University Applications of Satellite/Cable Technology was to stimulate discussion among universities, industry, and government on the possibilities of satellite and cable technology in the future. Twenty-six presentations were made covering the following topics: the current status of satellite/cable technology; the needs of higher education, public service, and research which can be met by communications technology; the role of government in satellite/cable communications; the economics of satellite/cable systems; and designs and innovations in communications technology. Nine of the articles describe specific experiments and demonstration projects in satellite/cable communications in higher education. (CH)

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A REPORT ON UNIVERSITY APPLICATIONS OF SATELLITE/CABLE TECHNOLOGY

FIRST ANNUAL INTERNATIONAL COMMUNICATIONS CONFERENCE

UNIVERSITY OF WISCONSIN–EXTENSION

COMMUNICATION PROGRAMS

U S DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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PREFACE

Educational Telecommunications are in a state of flux that is common to the entire telecommunications industry. In perhaps no other area of technology are changes coming so quickly. A communications satellite was launched, and new delivery systems were tested in Appalachia, Alaska and the Rocky Mountains . . . Far reaching decisions are being made by the courts and the Federal Communications Commission on the roles of cable television domestic satellites. The impact of new technology is being felt as slow-scan television, interactive telephone conference systems, on line computer systems, broadcast transmission and other innovations are opening up enticing possibilities for higher education. A Public Service Satellite Consortium is being formed to meet the needs of various national and regional potentials of communication satellites. The potential of cable television is also being explored by the National Science Foundation's two-way Cable TV demonstration projects.

In such an environment it is useful to "freeze the action" at finite points in time to provide insight, thoughtful considerations and mileposts against which to judge future change. It was our intent to provide such a milepost as of mid 1975. A conference on University Applications of Satellite/Cable Technology was held in Madison, Wisconsin, June 3, 4, 5, 1975. The Conference was presented by the University of Wisconsin-Extension, Department of Communication Programs and co-sponsored by: the National Association of Educational Broadcasters, the Cable Television Information Center and Public-Cable.

The broad aim of the conference was to stimulate an ongoing discussion among universities, industry and government on the national and international possibilities of satellite and cable development in the next decade.

Conference Objectives:

-- to report on the current status of satellite/cable technology
-- to determine those needs of higher education, public service and related research which can be met by satellite/cable
-- to facilitate formal and informal exchange of information and experience among educators, technologists, industrialists and government officials
-- to stimulate decisionmakers in the development and implementation of educational applications
-- to explore the future technological capabilities and satellite/cable
-- to suggest appropriate hardware and software development

This report is designed primarily for educators, technologists and government officials to give them a basic grasp of the potentials of satellite/cable TV for education.

The report does not pretend to be fully inclusive. It is intended, however, as a benchmark, a point of recording what has happened and providing an opportunity for educators in this age of new ideas and changing technology to explore new educational learning styles that will meet the needs of students and modern communication systems.

The reports of the conference reflect an age old problem: the technology for Satellite/Cable systems is far ahead of program development. We have modern communication tools--but the questions remains, how are we going to use them effectively?

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Any conference or a national-international scale is the result of efforts by a large number of people. So many have helped in this case, in fact, that there is not enough space to recognize them all individually. In making any such list, there must inevitably be some omissions; I can only hope that there are few and that anyone who helped and does not appear here will understand.

Special acknowledgment for early advice in planning the conference must go to the program planning committee: Dr. Rod Wallace, Dr. Glenn C. Scott, Barry Fitzgerrell, Charles Fowler and Dr. E. W. Ziebarth.

Obviously, those who actually wrote sections and made presentations for this report deserve many thanks. We are particularly indebted to those authors who assisted in preparing their own manuscripts for print. In addition, many other people gave us advice and guidance along the way.

All of us who worked on this project are not thanks to the Instructional Communications Services staff for their support and assistance.

A special sense of appreciation should go to Dean Luke F. Lamb, Educational Communications, and Dr. Arthur Krimel, Chairperson, Communications Programs, for their encouragement and perseverance with this project.

A note of appreciation is due also to those who helped with the technical production of this project: Deanie Gilbertsen, Richard Seifert, Ken Stefanie and Joseph Setchenski.

A special thanks to all the University of Wisconsin-Extension faculty who devoted their time and energy to this project and report.

Thanks also to Mrs. Judy Myers for her excellent clerical assistance.

And finally, special thanks go to Bernd Stromboni who was my colleague on this project as the author of editorial assistant on this report.

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power. The satellite and cable systems that are yet to be created and used to diffuse "education", domestic and intercultural, could be the media for bringing to Americans and others the learnings and understandings that will help us live together on this small planet in healthier, more active and productive ways than is now the case. But this, I suggest, will not be the conventional education of schooling; it will find its best acceptance in the adult field; and will engage universities as unique resources for program development that among other things would help maintain the health of our popular culture. With respect to the recognition of the true place of continuing learning in society, this would be the greatest assistance that could be provided to schools and schooling.

Ladies and Gentlemen,

A keynote speech is intended to spark controversy, suggest some targets, and energize conferees to "have at it". Well, now it's your turn. We are privileged to have you here. Your experience, insight and expertise may help all of us to participate in a healthy, active and productive conference. Good luck and best wishes.

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SOME POTENTIAL LEARNING COMMUNITY COMPETITORS FOR THE USE OF THE ALLOCATED BROADCAST SATELLITE FREQUENCY SPECTRUM

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Abstract

Frequencies have been allocated for broadcast satellite services, and there has been considerable stress on use of the frequencies by the educational community. However, competition may arise for use of the allocated spectrum from other organizations who have learning needs. Some competitors may be the health professions, correctional institutions, the legal profession, industry and business in general, and the military establishment. To avoid problems of competition, a representative working group of potential users should be established; a more practical use of the allocated frequency spectrum should be permitted by seeking uplink allocation to complement current down-links; orbital slots should be reserved for social service satellites; more broadcast spectrum bands should be allocated if the current allocations are insufficient to provide for all users; and research should be continued in the higher frequency ranges to determine the practicality of supporting broadcast and other communication activities by use of these frequencies.

Introduction

In less than 15 years, the groundwork has been laid for the use of communications satellites for social services. Beginning in the 1960's and continuing, there have been serious discussions about, debates over, and proposals for use of orbiting broadcast satellites for education, training, and social services. As Table 1 shows, since 1970 there have been related demonstrations and experiments conducted with Applications Technology Satellites (ATS) and such activities are scheduled to continue with the ATS's and the Communications Technology Satellite (CTS) launched in December 1975.[1,2] In the summer of 1971, the United States delegation to the World Administrative Radio Conference (WARC) advocated use of the 2,500- to 2,690-MHz frequency band for satellite educational applications. The WARC recommended this and two other frequency bands for broadcast satellite[3] use. To capitalize on the use of these frequencies, the Public Service Satellite Consortium was established in 1974 under the sponsorship of NASA and HEW--primarily representing education, health, and public broadcasting interests--to work toward eventual establishment of an operational social service satellite system.[4]

The stage is set, but just when broadcast satellites will become operational depends on a number of political, sociological, and economical factors; to put it simply, these factors translate into basic supply and demand--when there is a constituency with sufficient demand for services and the money to pay for such services, broadcast satellites will become a reality. With the growing awareness of potential applications of the technology, this should not be too far in the future.

Table 1. Satellite Experiments

STATUS / COMPLETED:	DATE CONCLUDED	SATELLITE DESIGNATION	PURPOSE
CORPORATION FOR PUBLIC BROADCASTING	1970	ATS 1,3	TRANSCONTINENTAL INTERCONNECTION
STANFORD UNIVERSITY	1971	ATS 1	CAI DISTRIBUTION
NPR/ALASKA	1972	ATS 1	EDUCATIONAL RADIO
NLM/OE/ALASKA	1972	ATS 1	MEDICAL/PUBLIC/ EDUCATION
LEAA-FLORIDA/CALIFORNIA	1972	ATS 3	DATA EXCHANGE
STANFORD UNIVERSITY/ BRAZIL	1973	ATS 3	LECTURE, SEMINAR, DATA EXCHANGE
UNIVERSITY OF HAWAII	1974	ATS 1	PACIFIC INTER-CONNECTION
NASA/CPB/HEW/FRMR/ARC/ ALASKA/NLM/NAM/VA/BRAZIL	1975	ATS 6	ETV-MEDICAL/PUBLIC/ EDUCATION
APPROVED:	ESTIMATED START		
NASA/INDIA	1975	ATS 6	ITV HEALTH, EDUCATION, WELFARE
NASA/FRMR/ARC/VA/ WAMI/CANADA/NLM UBAFR/COMBAT WESTINGHOUSE/ ARH/STANFORD/CARLTON/ DENVER/S.F. ARCHDIOCESE	1975	CTS	MEDICAL/PUBLIC/ EDUCATION, CAI/ETV

Unfortunately, with this growing awareness there may be growing competition between members of the learning community for use of the broadcast satellite frequency spectrum. This community extends beyond the traditional educational environment to include all entities that have learning requirements, whether they be elderly adults or individuals in a giant corporation. Because the current frequency allocation restricts interactive usage and limits the number of TV channels to about 25,* it is conceivable that the demand for learning services may soon exceed the available bandwidth, particularly if competition for its use arises from outside the traditional educational environment.

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*The number of channels can be increased through polarization diversity, and the same channels can be simultaneously used in different geographic locations if the satellite is equipped to concentrate the beams accordingly. Other satellites operating in different geographic locations can use the same frequency bands.

The purpose of this discussion is to explore some potential broadcast satellite clients with education and training requirements who may be competitors of traditional educational institutions for the use of the broadcast satellite frequency spectrum.

Broadcast Satellite Technology

Before proceeding, there is a need to establish a basic understanding of broadcast satellite technology, its capabilities, and the restrictions imposed upon its use. First, addressing communication satellite distribution systems per se, there are three basic types of systems: point-to-point, distribution, and broadcast.[5] Of concern here is the broadcast satellite, the most powerful that can be used for community or individual reception.[6] As illustrated in Figure 1, the 1971 WARC limited broadcast satellite transmissions in the 2,500- to 2,690-MHz band to community distribution which permits local cable company, broadcast station, or institutional reception and prohibits individual reception, including direct home reception.[7] Further, transmissions in the 620- to 790-MHz band are limited to television stations. However, no transmission restrictions have been placed on the 11,700- to 12,200-GHz band; therefore, with the approval of the FCC, direct home reception is possible.[8]

The power of the satellite affects the earth station or receiving system: the more powerful and stable the satellite, and the more concentrated the focus of its signal on the earth, the less sophisticated and expensive the receiving system.[9] Except for the 11,700- to 12,200-GHz band, there are restrictions placed on the power of broadcast satellites because of their possible interference with terrestrial communications systems.[10] Theoretically, if interference were no problem, a satellite could be built with sufficient power and associated characteristics to transmit to television, radio, and computer sets containing miniaturized, built-in receiver components. The capability would eliminate the majority of the front-end requirement as we know it today. An example of some front-end receiving components is shown in Figure 2.

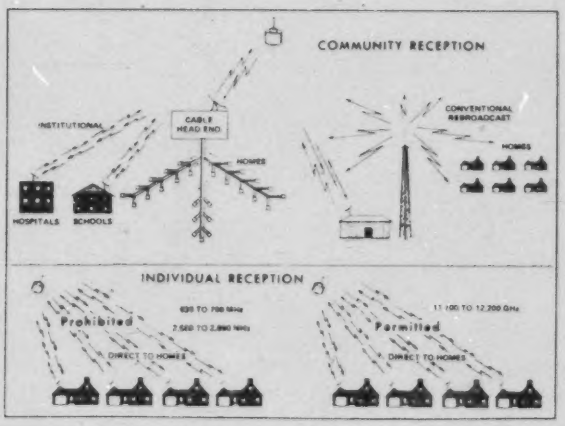


Figure 1. Direct Broadcast Reception Systems

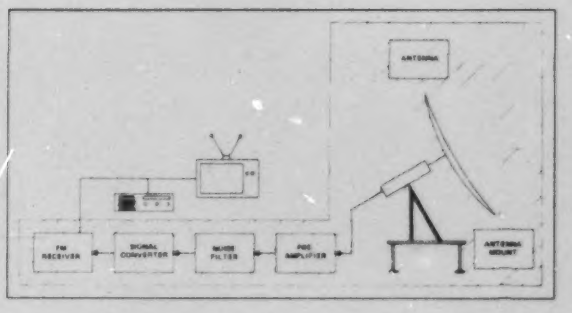
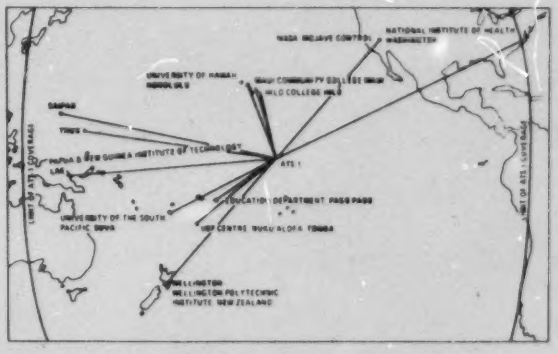


Figure 2. Receiving System Front End

More specifically, the satellite is a relay system capable of handling any signal that can be transmitted terrestrially via microwaves, local cable systems, or broadcast stations. In fact, in many ways the satellite is similar to a local broadcast station, but capable of larger geographic coverage from its relative stationary position 22,300 miles above the equator of the earth. From this position, signals can be showered down over one third of the surface of the earth. And, theoretically, anyone in the signal footprint who has the proper receiving system can access the relayed information.

Some potential applications of the technology become readily apparent when consideration is given to the coverage area of a single satellite and the geographic distance from which signals can be received without complex terrestrial networking support. Figure 3 depicts the coverage area of the Applications Technology Satellite Number One (ATS-1).* One point to take into account is that



Source: "The Serendipity of Synchronous Satellites" in *Vectors*, Vol. XV, Summer/Fall 1973, p. 28.

Figure 3. ATS-1 Coverage Area for PEACESAT Project

*The ATS-1 is primarily used for radio interactive transmissions; however, some facsimile and slow-scan TV have been transmitted. For more information about the project, contact the Director, PEACESAT, University of Hawaii, Honolulu, Hawaii 96822.

satellite system costs are not governed by all factors associated with terrestrial system costs; thus, satellite systems have the potential to provide less expensive communication services. Another point is that the technology can permit aggregation of dispersed demand for services; in other words, the technology allows large numbers of widely dispersed individuals to simultaneously share services, personnel, equipment, materials, or other scarce resources. In this same vein, the technology also can permit individual or personalized service, perhaps more cheaply, by letting a larger number of dispersed individuals with unique needs come together as an aggregate to use a service, and so on.

While interactive usage is possible and desirable in many instances, there is a considerable cost increase* because ground segments must be built to be both a receiver and transmitter. The cost also increases for use of the satellite, since both receiving and transmitting channels are used. Finally, the interactive medium to be used influences costs, with TV-type video requiring the greatest bandwidth and thus costing more than audio or digital signals.[11]

Relay distance creates some problems for interactive audio and computer communications. For example, a simple transmittal of "hello" with the respondent's "hello" returning to the initiator takes approximately 500 milliseconds.[12] This is due to the round trip distance that the signals must travel. This delay can hinder Computer Assisted Instruction (CAI) systems if not taken into account.[13] Problems can be overcome with buffers and compensating programming. Echoes are also created in audio interactive communication[14] but they have been eliminated by echo suppressors and the use of earphones.

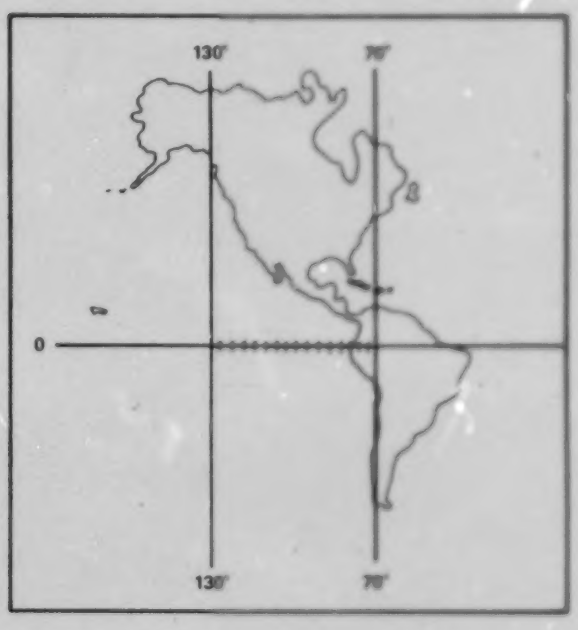


Figure 4. Available Orbital Slots

*The costs are considerable if the reply link is video, nominal if the reply link is audio.

Next, there is a need to discuss orbital "slots," the locations of broadcast satellites for relaying signals between points on the earth. While space is infinite, places where communication satellites can be "parked" are limited, with the best locations for the U.S. being geostationary orbits* between 70° and 130° West longitude. As Figure 4 depicts, these same locations are best for Canada, and perhaps some of the Central American countries.

To avoid interference between satellite transmissions, currently the satellites are being parked 4 or 5 degrees apart.[15] Consequently, the desirable 60-degree arch will accommodate only 12 to 15 evenly spaced satellites.[16]** Currently, five satellites are in orbit, three of which are Canadian; one additional satellite has been assigned a parking spot by the FCC; and five additional spots have been proposed by other U.S. domestic companies. Therefore, 11 parking spots have been tentatively accounted for, with none of the Central American countries in the picture at this point. Thus, it appears that most of the orbital slots will be accounted for in the near future by domestic and foreign commercial or government satellites.

In closing this discussion of the technology, there is a necessity to look more closely at the frequency spectrum available for broadcast satellite service. The primary allocated frequency band of 2,500 to 2,690 MHz is a good frequency band--the technology has been tested, hardware is available, and the signals are less vulnerable to earth surface environmental conditions than at the higher frequencies. However, as Figure 5 shows, the frequency band is shared and there are also problems with frequency use on the 2,690-MHz up-link end of the band due to interference with radio astronomy activities.[17] Moreover, this band will accommodate only 5 to 6 television down-link channels or their equivalent and provides for only one up-link channel.***

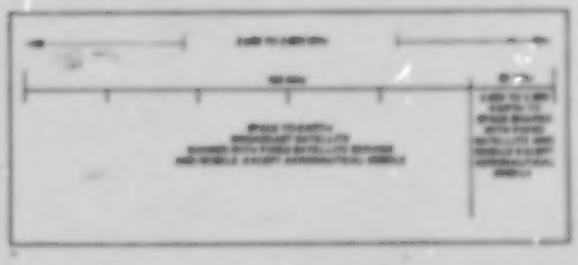


Figure 5. 2,500- to 2,690-MHz Broadcast Satellite Frequency Spectrum Allocation

*This is a satellite orbit located 22,300 miles above the equator of the earth where the satellite moves relative to the earth at approximately 6,900 miles an hour and appears stationary since its movement is synchronized with the rotation of the earth.

**This is currently the case for satellites operating in the 4- and 6-Gigahertz (GHz) bands since the band is used by all carriers; therefore, such parking distances are required to minimize signal interference.

***The 2,500- to 2,656-frequency band could not be shared effectively for both up- and down-link transmission since this would require a 4-percent frequency separation between these transmission channels.

A second band that has been earmarked for broadcast satellite use is the 11,700- to 12,200-GHz frequency band. But, as Figure 6 illustrates, it also is shared, plus the total bandwidth is available only for transmitting from space, thus providing 14 to 23 TV channels or their equivalent.[12] Furthermore, the technology has not been adequately tested for use in this frequency band, hardware is not readily available, and as signals increase in frequency they become more vulnerable to environmental conditions, such as rain. Testing in part of this band (12 to 14 GHz) is being accomplished with the CTS during 1976 and 1977.[13]

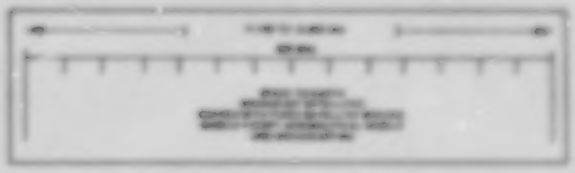


Figure 6. 11,700- to 12,200-GHz Broadcast Satellite Frequency Allocation

The third band which has been designated for broadcast satellite use is the 620- to 790-MHz frequency band. However, as noted before, it has been reserved for broadcasting to television stations; thus, its use is restricted. Further, it is shared. As Figure 7 shows, about six TV channels or their equivalent can be accommodated.

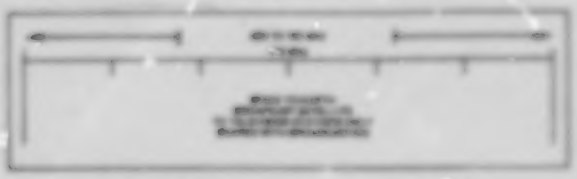


Figure 7. 620- to 790-MHz Broadcast Satellite Frequency Allocation

Bandwidth to accommodate 25 down-link TV channels or their equivalent has been allocated for broadcast satellite use. A resulting major area of concern is the available up-links to support the down-link capacity; only one up-link bandwidth of 35 MHz has been set aside in the 2,500- to 2,690-bandwidth. Therefore, broadcast satellite up-link capacity must be sought in bands that have been set aside for or shared by point-to-point and distribution satellite systems. The increasing demand for commercial use of these up-links could soon make it difficult to obtain desired frequency space for education/training and other social services transmissions.

These, then, are the basic capabilities and associated restrictions of broadcast satellites. It should be evident that the frequency spectrum available to the learning community for broadcast service is severely limited in space and restricted for use. Therefore, competition for this limited broadcast frequency spectrum could grow and become a serious problem.

Potential Competitors

A number of potential competitors for use of the allocated broadcast satellite frequency spectrum, including the broadcast industry, have possible uses for the spectrum that fall outside the classification of "learning"; however, the concern here is for those entities that have learning requirements, some of which may be satisfied by use of broadcast satellites. Consequently, these entities would compete with the traditional learning community (elementary, secondary, and higher education institutions) for use of the broadcast frequency spectrum.

Of course, this raises the question, What makes a competitor? There are many factors, but generally the following will be key: a pressing educational or training need; the ability to pay for the services that can be offered; the ability to influence decisionmakers; a knowledge of the technology and its application to meet a need; an organization to bring use of the technology to fruition; and a knowledgeable and receptive user group sufficient in number to make use of the system economical.

Discussed here are five potential competitors: the health professions, correctional institutions, the legal profession, business and industry in general, and the military establishment.

The Health Professions

Of the competitors, the health professions are the most knowledgeable about possible applications of the technology because they have been experimenting with the technology since 1971. They undoubtedly will be a major competitor for the frequency band they also have a significant membership of roughly 4.5 million persons.[14] Approximately 1.6 million of these are full-time employees of about 14,000 inpatient health care facilities.[15]

In recent years, the health professions have been subject to considerable criticism, much of which stems from the concern about professional obsolescence and the resultant impact on quality of patient care.[16] As a result, peer review, audit of charts and records, self-assessment by test or computer, and mandatory continuing education are becoming common practice in the search for a method to assay clinical competence.[17]

In 1967, the National Advisory Commission on Health Manpower broached the subject of relicensure, and since that sentiment in support of some sense of updating qualifications has grown within the professions.[18] At the national level of the professions per se, the American Academy of Family Practice, the American Dental Assistants Association, the National Board for Certification in Dental Laboratory Technology, the American Dietetic Association, and the American Registry of Clinical Radiologic Technologists require their members to obtain a number of continuing education credit hours each year to receive continued certification.[19] The American College of Physicians has established a program of self-administered, self-assessment examinations, while the American Medical Association provides a special award for physicians completing 150 hours of continuing education within a 3-year period.[20]

At the state level, currently five state medical associations require completion of a number of continuing education credit hours each year to be eligible for membership. In a number of states, regulations have been established or statutes enacted

requiring evidence of continuing "satisfactory" for optometrists, osteopathic physicians, dentists, dental hygienists, and nurses.[27] Thus, a considerable amount of money is being spent on continuing health education; however, no figures are available.

The health professions recognize that if they are mandated and enforce educational standards, the public can demand assuring legislation that will bring about such standards. However, the professions do understand the shortcomings of both the legally required and voluntary continuing health education.

Because of the very nature of the professions and the distribution of the members, continuing education can bring benefits to health professionals and the public. Members of the medical professions are an elderly component of the population of the United States, but are too few in number relative to the needs of the population. For example, for every 100,000 people there are approximately 151 physicians,* 48 dentists, and 375 registered nurses.[28] Moreover, the distribution of health personnel does not necessarily coincide with availability of continuing education programs. The availability of time to attend such programs is a major consideration in light of the demands for doctors, dentists, and nurses, and in view of the understaffing of many health care facilities. Attendance at continuing education classes (particularly for members of the professions who must travel a considerable distance to attend such classes) can further contribute to the shortage of health care professionals and substantially increase the cost of health services. Consequently, means for meeting the continuing education requirements of the health professions have been and are being explored.

Although not the only distributing agencies being explored by the health professions,[29] commercial and broadcast satellite systems have undergone experimentation and are still being explored as a feasible and desirable means of providing rural continuing health education organizations to all practicing health professionals. Starting in 1971, Hawaii and Alaska used the Fine Applications Technology Satellite (ATS-1) as a limited scale to explore the possible value of the technology to continuing health education.[30] During 1974 and 1975, the ATS-6 was used to some extent in Alaska, the Rocky Mountain states, and the Appalachian states for the same purpose.[31,32] Plans experimentation to be carried during 1976 and 1977 on the ATS, during which the Association for Western Hospitals, Inland Hill, NMA, and the states of Washington, Virginia, Montana, and Idaho (WAMI) will be involved.[33]

Therefore, the health professions are establishing a foundation for the use of broadcast services and other telecommunications systems to meet their needs for continuing education. If each one of the mentioned (plus to provide practical and economical[**] the health professions will be a major component for use of the broadcast frequency band.

Correctional Institutions

The correctional institutions, because of their purpose and characteristics, could greatly benefit from the use of broadcast services. While the correctional institution population is small, the population's cost to society is extremely high.

The number of institutions incorporated in the United States is roughly 17,000.[34] There are approximately 15,000 in of federal institutions,[35] 332,000 in over 200 state institutions,[36] and close to 141,000 in 3,272 county and local institutions.[37] These figures do not include institutions or holding rooms for the criminally insane.

The institutions who make up the prison community are as diverse in age, experience, services, programs, and learning styles as the populations from which they come.[38] As a consequence, when penal institutions provide to provide education and training programs for this diverse group, they are faced with the impossible task of providing an almost unlimited range of programs. Nevertheless, many state and local correctional budgets make no provision for full-time teachers or other classroom personnel to supervise education or training programs. With the exception of those graduates for academicians, programs are quite limited.

At the local level, 84.3 percent of the county and municipal jails have no educational programs.[39] Where programs do exist, most classrooms are poorly equipped, poorly lighted, inadequately ventilated, and drably furnished. In addition, the instructional media and methods of instruction are used by "school rental" educators, or "part-time" teachers from local schools.[40] This is not to say there are no exemplary cases to what is being described, for there are.

In the province jails, Texas, Connecticut, and Colorado have created an all statewide that include correctional institutions. In these districts, correctional institutions are allotted budgets, staffs, materials, and other resources necessary to make available to other educational institutions in the districts. In addition, some state and federal correctional systems have their own educational and vocational training facilities and spend an average of $23 million[41] a year on educational and vocational programs. Encouragingly enough, the Federal prisons plan to bring the requirement that all prisoners should some educational or vocational program for the duration of their incarceration. This decision is based on the belief that it is a waste of time to attempt rehabilitating of inmates if they do not wish to be rehabilitated.[42]

The concern over education and training in penal institutions continues to grow. Individual educational and training programs to a prisoners liberal to prisoners,[43] and the journals associated with correctional education and training are replete with articles addressing the problem. One thing is clear: the current educational and vocational programs of penal institutions have not been successful in rehabilitation, which is projected to be the greatest (see 60-percent recidivism of inmates. The reasons

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*Includes Doctors of Medicine (151,000) and Doctors of Osteopathy (11,000).

**The health professions are also experimenting to determine the value of satellites and other distribution systems as a means of directly improving practical health care.

***The $32,000 includes roughly $7,000 in training schools for juvenile delinquents.

****This is based on a 3-year average (1973, 1974, and 1975) combining "Industry Education" and "Other Programs" categories appearing in Table 321 in the Statistical Abstract of the United States, 1976, p. 196.

[illegible]

[illegible]

[illegible]

video communication? Or the Indian question, a very difficult one, I'm sure; I don't mean to be trite about this very serious one, but India made the decision to vault itself into the 21st century of aerospace, nuclear technology and at the cost of nineteen to thirty million people, they can't estimate it. But that's what is going to be wiped out as a result of their putting their energy and resources there as opposed to putting them into food, and I will give, from a humanistic point of view, Chairman Mao great pluses for the fact that he did decide against that; that they would spend their first resources to feed all of the Chinese people and they're on the cutting edge of it but they are doing it. There isn't any question about it, but the same decision made by the Soviet Union in the Twenties and Thirties has now been made by India just within the past five years, and their argument is that it will be great for Indian citizens in the year 2000 and on, but they're going to have to literally give up a generation of people.

The question of what happens when you suddenly give a whole continent, let's say the African continent, within the ten years and the next coming years, and you suddenly give them the smarts, to put it bluntly, when you create the key price of education, and that's true for anyone who's a graduate. And the key price of education, I tell you, is awareness; that's the key human price of any kind of education if you're really getting an education -- it's the verb 'educare': to free, to liberate -- and that awareness, and that's what's happening all over the world, and if they become aware that there is almost a Sargasso of poverty with a few islands of wealth, then you and I happen to be sitting on one of those islands. And as such, that's where the real sharing -- is there going to be, in China terms, a socialist consciousness developed in this nation to recognize that we're either going to have to share, or find a way for production to raise the entire standard of living of people elsewhere in the world, because if that does not happen, that awareness will produce revolution. It follows as the sun follows the night.

I was asked if I would consider being consultant to the Sultan of Oman. He doesn't have oil, but he's got a pipeline with a faucet that goes through his country and that comes out in his harbor, and who's interested in doing something for his people, 7 million Omanese or whatever they're called. One of the things in the initial discussion I had is that they had to be certain that the Sultan understood that once those people got the full range of this education, it would seem to me the first thing they would do is to get rid of the Sultan. And I thought in fairness he ought to be told that. Well, you know, Senator Nelson says we want truth in advertising and and packaging, and it's got to apply in our game. We've got enough problem lying in our catalog - I don't want to be guilty as a consultant. Just think, if the education business had to be like the automobile business, and we had to bring back our defective products. The class of '69 will return for Political Science III - we just found out that faculty member was nuts.

Well, in a sense, I think we can look at our own history of the development of the railroad and what's happening with the satellite/cable interconnect, and I believe those are the key runs of the future. At one point here, it looked like maybe I was going to replace Nick Johnson - I don't know if that would be an improvement or not, but the key problem I think that I had, at least with major broadcasting sources, is that I came out at a satellite conference and said that I believed eventually I wanted all television off the air. I still believe that, I think it's a waste of a very precious resource; we don't use television mobilely as we do radio. Radio needs to be broadcast, but television does not; it's a stationary mode, we can wire everybody up -- or close to it -- and free up all of those frequencies for development of a private communications industry. That's still a very firm belief of mine. It's not an attack on television, as some of my former friends in that business think that it was. Well, Wally Schwartz, President of ABC, called me right away and he said: "You're all wrong." I said: "No, you're wrong; that's why I give you a C twenty years ago!" I really believe that we can do that, but whether we will do it will depend upon the vested interests. What we do with cable and satellite, it seems to me, has got to be based on the economics, because the potential for money in cable and satellite combination is so great that it's got to be economically feasible. And anything that will ultimately make money -- and I want people to get in and use it and make money; they'll make money, they earn more money, they pay more taxes, and I'm on the other end of that trough - so I'm not opposed to that kind of approach to life, don't misunderstand me on that. I do think, however, that we could, in fact, move in that direction, and I wonder at those who say, "Well, it's just not possible." We've got seventy per cent of all Americans on the end of a sewer so, if we can do that, it seems to me that we can do something about cable.

Cable is essentially -- and satellite -- are the future as far as I am concerned, because that's where I personally believe it's all going to go, and I think this is where we can do a pioneering job for the entire world; to demonstrate for them what can happen within a society. I was asked by the Channel 3 guy when I came in, "what do you think cable will do and have an impact on society?" I said, "I can't judge that ahead of time, but I do know what television has done to us in two and

three decades, and cable is to broadcast television like the Niagara Falls is to a garden hose." So if it's got that kind of a relationship, it will absolutely change the interrelationship of people, and the key thing it can do that broadcast can't do, the combination of satellite and cable, is to allow this two-way communication. So I think there is some truth for those who are giving -- I guess Rex Lee and Frank -- I think they've given you some hard time; I'm not sure who are the actors and I don't have a score card, so I'm not sure who's playing what position, but there are those who say that the key thrust of what we do now in the next five years has got to be the low-cost receiver-transmitter input type of satellite and the easy access combination and, in effect, satellites that will deal with small areas of the earth, rather than one giant thing that's going to provide a sun so that Domsat's in his heaven and all's right with the world. That I have real concerns about because it begins to take on a Peking version for me. I don't know about one giant thing that's going to spread it out over all the land, this kind of 'security blanket' of education, as opposed to the use of a system that will allow for cheaper input and output. Professor Wedemeyer, who did your morning speech, and I developed a proposal of just that kind of a system in 1967. I haven't made much progress since then, so I suspect our proposal wasn't that good. But this notion of two-way interconnect; in 1965, that is, ten years and three days ago today, I was able to take the equipment - I then managed WHA-TV here in Madison - and crew out to West Bend and, via the satellite before it went commercial, interconnected it with the Lycee Henri IV in Paris. Now, that has been criticized in an official UN document by one of the French ministers because: one, they wanted to control it and didn't and, two, essentially they thought it kind of a waste of time. Here are a group of 16 and 17-year-olds talking to each other: the American kids had to talk French, the French kids talk English. Quite frankly, the issue was that they didn't talk about very serious things. Well, I don't know; listen to most of the UN debates or go and sit down in the Legislature, if you want to get at it. I'm not even criticizing that. I think Carlisle was right: if you like law or the sausage, you don't watch either one being made. I think in terms of what they did, however, as human beings, they talked about things like: how old do you have to be to drive in your country?, and do any of you own cars? Does it bother you to have girls in the classroom with you? And they said no; and they asked the French kids: does it bother you not to? The instructor in West Bend, Wisconsin had an obviously different relationship with those kids and, before that hour was through, those French youngsters were kidding around with him, something they would not do with the man who was at the front of that class as the Headmaster at the Lycee Henri IV in Paris. Headmasters at the Lycee Henri IV do not kid around; they're still trying to produce a Louis XV to follow the XIVth. By the way, I don't think as you look at what you're doing, that you ought to be in the position of defending the old, although some of the old needs defending. We do that quite often in education. I argued with Professor Doxtator of English as I have one big problem, the students coming out don't seem to use English, and I talk about the "diagrammatically disadvantaged", which tends to date me a tad in terms of teaching English. In fact, when I said that, he almost hit another car. And we point with pride to the fact that we've done so well in atoms, space, electronics and so on, and we've had great leaders like Einstein and Fermi and von Braun and Zworkin and Kissinger, and so on, none of whom came from our educational system. But we're going to run out of Germans that we can steal, and on that basis, we're just simply going to have to develop our own, and it seems to me that the satellite and cable in combination has got to be the point at which we destroy the parochialism. We destroy the hick, if you will. There is no place that is out of the communicative mode, but it has to be both input and output. And I also say: don't give any money to educators to do research on it. When I think of some of the research we've done, it has been flea research. Most of you know that story, but for those of you who don't ---- There was a man who wanted his flea researched, and brought him in and they put the flea down and he jumped, and they calibrated the trajectory, distance covered, ergs of energy, amount of impact, time elapsed, right down to the fourth decimal point. Took off two legs; you know, there was smaller trajectory, more ergs of energy, more time elapsed, shorter distance. Until they took off all the legs, told him to jump, and he didn't move. So they screamed at him to jump and he still didn't move, and they brought in electronic amplification -- just reverberated the room -- yelling at him to jump - no movement - they put in the zeros - probably applied a T-test or chi-square, and came to the conclusion that if you take all the legs off a flea, he goes deaf!

You know, I see people sitting around here - Burton Paulu, Charlie McIntyre - you know, I'll bet you guys can't add up, and I can't either, how many times did we compare the television classroom with the average classroom, or the standard classroom? And I now know what the problem was: there's no such thing as a standard classroom! But why put television in school, why put cable in school, why put the satellite in the school? Well, I suppose the answer is: why put life in the world - in school? Because that's where it's at, and that is the environment. The environment today is ideological, it is not physiological. We can avoid that and, in fact, do so. I'd come out

of my air-conditioned house into the garage into an air-conditioned or heated car, and I now have a problem that I have to traverse forty-eight feet from my parking lot to the building I work in. By the way, that's an advantage of being Chancellor, you get a good parking place. But we do avoid the physical environment; the real issue is this constant milieu of the ideological environment, and I became so conscious of that in China, and I was very critical of it. The same phraseology -- I mean, I got tired of statutes of Mao and pictures of Mao and wise slogans and sayings and so on of Mao, but then I thought we just don't happen to have it in one form and in the cult of one person. But we do the same thing. We do it in many ways; it's not that rigid, and it isn't controlled out of one set, but we do create that kind of ideological involvement. By the way, before I left China I sent back to my campus, and I had them order forty-seven statues of me and 584 pictures, one for every office and room, and then a whole bunch of wise sayings and slogans to put around, but that's where they had trouble, they said they couldn't find more than one, and that was the one where I said I was going to leave in five years after I came.

Television is already part of the educational process. I'm not sure we've fully accepted it. Early childhood education now is parent and TV, so that it simply is: broadcast today handles, I think, reading readiness, handles math introduction, socialization, environmental principles, world affairs and awareness and so on. It's just simply occurring. That kindergarten, that 'children's garden' which originated in this country in Watertown, about 40 miles East of where you're sitting, and Karl Schurz -- that kind of concept no longer of value. You don't need a children's garden to help adjust a child from the nursery to the school. There is no youngster today who goes to school who doesn't know exactly what goes on in that school. He's seen it all; he knows who has to play what role and how it works. In the 70's then, clearly, we are dealing with youngsters who have giant video reception experience. I believe that in the 80's students will come to school and will come with video hardware and production experience, and that's where I hope that comes about. I notice you have somebody from Alternate Media; I think that's the same New York-Antioch connection. I was part of the North Central accrediting team that had to go out and accredit them. We went up to Mamaroneck, where you could see youngsters who were into the video hardware equipment, but it led them to the old media. They were into still photos, they were getting back into print; in other words, it just simply didn't move them into that run. But they were clearly becoming producers, and I think that possibly one of the things you ought to consider when all of this is done is how will it affect education in self-production. Will it now, instead of making a consumer -- the old educational theory of "open up the top, pour in the pitcher" and so on -- instead of this, get back to the producer of educational concept who may be that third, fourth, fifth or sixth-grader. We eventually can get back to the one-room school. We knocked off all those schools because we thought they were bad, although every time you read about some great guy in this country, he came from one of them. But they call it 'ungraded' now, so I think we'll be able to do it. Self-production will boom when mass distribution comes, and cable and I think satellite could do that. And if you consider the spinoff of home and school, when parents can watch at 10:45 to see what Johnny produced, and I've mentioned that to the newsman from Channel 3 who stopped me, and he said: "Do you mean like out of Cherokee School, those kids are going to produce a program?" and I said: "Right". He said: "Well, how many are going to watch that?", and I said: "Well, all the parents of the kids in the Cherokee School 8th grade." Within a current mode, you can't consider any program at least nationally successful unless 20 million people are watching at one time. There's the potential for the monolith, but if we get enough capability-and I do believe that multiplexing, cable, satellite will produce that -- then we begin to use it on an individualized basis. Right now, in fact, you can clip things from broadcast and put it on in class to show youngsters, although the Copyright law is moving into that. I think eventually that law will be broken and it will be reworked, because though I don't believe it's right to steal in the name of education, I think it is wrong if the sheer cost factors of getting at the taxpayer dollar affect education because of copyright limitations.... that's another whole run and I won't get into that. But that will have major impact in terms of why and what we're doing with satellite and with television. But why, when you're faced with two programs--last year they put on the first showing of the Jane Pittman autobiography--incredible program, but at the same time, on the opposition run on one of the networks "The Primal Man", another incredible program. And now we are at a point with hardware where you can take both and they can be put into the class, because, by the way, an interesting sidelight: one of my aides has a nine-year-old son, and the Pittman program brought out this New American Child that I think no longer lives in the boondocks. Because here's a kid who lives in a 25,000 all-white town in the middle of Wisconsin, and that clearly, before media interconnect, would be boondocks. At this point it is not, because they have television from Chicago, Milwaukee and most places within the state as a result of what is a very simplistic cable system compared to where it's going to go. There were some things he was confused about

though, in watching that Pittman program. Instead of saying to his father, because I think the racial issue is beginning to move by and we're moving into others, he wanted to know why they were going to hang that teacher, and he saw that man as a teacher and not as a black man. And I think that's a very positive step forward. For him that was no longer the issue. The other thing that he did that I thought was extremely important was that at the end of the program, where Jane Pittman goes up to where they have the two water fountains, one for whites and one marked "Colored", and she goes up to drink out of the White-labeled water fountain, his father said to him: "What do you think about that, two water fountains like that?", and he really looked perplexed at that, and he said, "Boy, that's really terrible"; he said "You know, that's really a waste of water, isn't it?" For 1974: water, environment, and where does that come from? That is totally the impact now of an entire society beginning to react, and this nine-year-old in the middle of the state of Wisconsin, where we've got water up to our eyeballs, we are not short of water, and yet he was aware that his entire society was short of water. And that's where I think the hope of that instrument eventually will come through. Whether it's cassette slant-tracks, which can show things at any time, the key thing for me is that the machine can be run by the students, and I think that's the issue.

As you shift, then, in looking at broadcast and cable, where you don't talk about a Channel 10 or a Channel 21, but 10.1, .2, .3, .4, .5 and so on out, etc. etc. as the King would say in Siam. We are no longer limited. Now the railroad is coming -- I'm convinced of that -- and it's not coming with a single track, and it is important that industry, government, educators, make sure that we build the right kind of stations, if you will, in every single community, because it need no longer be a decision where we're going to put it. You know, the key lead community, Comanche, Iowa of the Territory of Iowa in the 1840's, they decided to put the railroad terminal at a little-known place called Des Moines. When that occurred, Comanche is zip and Des Moines is the big community, as you well know, by that kind of decision. We don't need to decide that way and force people into these concentrated, urbanized kinds of ghettos. We have already done that - seventy per cent of all Americans live on 1.3 per cent of the land. We don't have to do that to get services any more. They now can, through cable and satellite, begin to move, and we transmit ideas everywhere. But the satellite either has to be looked on as a delivery system or an environment, and I think if I can get those two terms as you look at it--I think it's a key issue. In a sense, when Wedemeyer and I put a proposal together in '67, it was a delivery system. From Madison, we were going to reach Peru, and we had a whole series of places, and we were going to give them the largesse of our great educational system. Real neat bit of patronizing, as I think about it there, especially with my background in this state, because, you know, we get a little sclerotic as we age out, sort of like the amnesty issue. You're in a state, by the way, where most people here are descended either from enemy soldiers or draft dodgers, and they make the most noise about things as the issue of amnesty. It's just a function of getting older, and it's a thing I think we have to resist. My concern about the current trend is that we may be in the process of building a delivery system, and that will require very expensive reception and distribution points. And I think that will, in effect, cut out education. It will also, if it's broad-band enough, and enough frequencies on there, I'm afraid that the whole spectrum gets tied up by some giant satellite that shines over us all. And that's been one of the arguments of some of the opponents and I can't separate out the shrieking voices from the good ideas. But you've got people here who, I think, really can address themselves to these questions.

There could be such a thing as spectrum pollution if we put in the wrong system. The ATS-6, I think, is an example of a good one, and worked well with 186 locations in twenty states out there. It is not being extended, and the ATS-F is not going to be a follow-on, and the White House has made the decision, I think, more than anybody else, that that not happen. But there was remote delivery of education and medicine, certainly in the Alaska project; I noticed when I came in, the Appalachian project is being demonstrated, and whatever you can see on that, please see it. But essentially, a process that is two-way, and it's cheap. The current White House approach - I have a copy here of Mr. Ash's letter - in which he responded, in this case, to Senator Beale, but one paragraph says the capacity and geographic coverage of the ATS-F prime was too limited to permit expansion of the current services; that the ATS-F prime was an expensive way to maintain satellite capacity for the present users, and that a launch of that instrument might discourage the participation of private communication companies in providing the services. And I have a real mixed dilemma there; I do want to protect the private utilities and I want to see them grow, because I've tried to use telephones everywhere in the world. By the same token, too much of anything can be a problem, and I am concerned that the current White House posture is in the direction of protecting not the educational and public interest, but is in the area of protecting the utility interest. I'm not worried about that, because if Mr. Ash keeps that up - and a few others - there'll be a new administration in there in a year and a half, and then we can

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start out from scratch. That's a decision they've got to make about their leadership and how well they're going to support him. But I do believe that in all the states, legislation is in danger; I do think that the question of low cost and high capacity satellite is an issue. I hope you're addressing yourselves to that. The question of whether we have 100 satellites covering small areas--somebody said "How are we going to fire them all up there?"--just attach them to the shuttle program; you can drop them off on the way up. That's got 1.2 billion on it just for the first phase. I would think they would be able to drop them in. And I think we're also getting close to some treaties internationally, and that begins to lock us in. In other words, we lose our flexibility. The medical demands alone, if they are predictable, and Weinberger's the one who said this just this winter at the Aerospace Convention, about all the value of this personal kind of medical interconnect -- but those demands alone, for specific utilization, are so great that I think only the kind of satellite that NASA has urged -- the 100-meter antenna type -- can permit the multiplication of spectrum capacity to meet that need. That at least is an issue, and I'm giving you what is a cursory view, and by now I'm sure there are enough heckles going that you'll get some response in the course of the conversation. I don't know the answers, but that does not invalidate my questions. Durward Long, formerly our Center Chancellor here in Madison, now out at California, I think, has outlined the questions well when he took the California position -- you may want to get a copy of that request -- in terms of what should be done with satellite program. In the spectrum, the key issue I think, in fact, that was probably a key issue why I'm not on the FCC and it's a good thing--my wife was quite delighted with it--namely, that I think that spectrum is the most precious natural resource left in this United States barring none, and we've got to now think about how we are going to piece that out in such a way that we don't get locked in on tradition. The danger is that education and medicine will be aced out; that rural areas will really be aced out in terms of input. I'm not talking about getting the Great Beam shining on us. I'm saying that I think Hicksville is dead, and we don't want that beam shining on us. The notion that Dumont will be in his heaven and all's right with the world - it could be as ubiquitous as the statues and slogans of Mao. Oh, how the Federalists 200 years ago would have loved where we may be going, if I think I'm right. Hamilton, Adams and Jay live again, and they must be delighted with the prospect. Now, lest you think I'm suggesting a conspiracy or plotting, I'm really not; that's not the issue. The real problem, generally, has always rested with educators, because our track record is lousy. You can eliminate all AV and TV today in the education of the United States, and I don't think it will cause an ideological ripple, and the guys that'll make the most noise are the manufacturers of the equipment. I mean that seriously, and I suspect it's the teacher who has been the most resistant. The individual faculty member, I've fought that problem myself, and I've also been on the other end where I resisted because I said I haven't got time to do that, you know I claim I'm anti-print, because otherwise I could prepare a paper for today, but that's not true -- I just didn't have the time to slide one in. And as a result, that's what is happening with teachers; good teachers are busy, but it takes a special kind of people then, to say: "How can we make your teaching better utilizing all this equipment?" We are cost conscious and we have to be cost conscious if you were in this state, you'd get very cost conscious, and I gather what's happening in Wisconsin is not unique across the nation.

One last thing on cable teaching and function, and that is - again the question will come up - the cost of replacing teachers. That's a critical issue, with a plethora of teachers all the way to the Ph.D. level and, on that side of the issue, I have laid off tenured faculty. In my business that's a giant sin, there's just no question about it. Quite frankly, that will raise up those concerns of protecting the club, to keep the society intact. And costs and cheap arguments -- let me just give you two things on that: one, I've not yet seen in the 30 or 35 years that I've had the privilege of being involved in the business you're in, that it ever produced a cheaper cost, so I hope it doesn't get sold on that basis. If you're going to do something well it is probably going to cost you more. And the other one is that if you've got media, satellites, television--I don't care what it is--cable, that can replace a teacher, that teacher ought to be replaced and as rapidly as possible, because teachers are not purveyors of petty accuracy; teachers ought to be the human interrelationship between children, and that's something media cannot do in and of itself. The teacher is the mediator of experience, then and a teacher teaches primarily what he is and not what he knows. So will you, then, within the conference, begin to think of multi-channel input and output, interconnection of every classroom, every office, every school, every system. And in a sense, don't worry about those who say "Well, that's pie in the sky". It could well be, and we've heard that before, but pi is also 3.1416.

Thank you for having me.

[redacted]

Presented by

[redacted]
Director of Engineering Research
Corporation for Public Broadcasting
[redacted]

INTRODUCTION

The prospect of using communication satellites for the interconnection of public television stations in America was first discussed in 1958. Two and one-half satellites have been built and are in orbit, low cost earth stations are available across the nation, and new frequency bands are coming into use which make prospects even brighter. A recent study performed for public broadcasting has clearly demonstrated that even by the worst case allocation, public television and radio can benefit significantly by moving to satellites, not only in terms of growth and quality, but also in flexibility and local autonomy. There are no longer factors and give-to-the-sky dreams. Channels are presently available; there is a real prospect of an abundance of channels; and there are also attractive leasing prospects, and the possibility of local ownership. In addition, there are presently at work a large group of non-profit users, who have formed a users-committee called the Public Service Satellite Consortium which could offer a variety of services not yet available from the common carriers. Although such a corporation cannot will have many hurdles, its potential rewards have great appeal to public broadcasting and other potential users.

What is most surprising to many observers, is the unusual swiftness in which these concepts have moved from the theoretical to the practical.

EVOLUTION OF COMMUNICATION SATELLITES

In an article in Wireless World in 1945, Arthur C. Clarke, the well-known science fiction author and scientist, described an artificial satellite which could be launched into a stationary orbit 22,300 miles above the equator to provide communications for the world. Clarke's prediction, as we shall see, did not come true until almost 20 years later.

In 1955, a small contour-shaped satellite named SCORE was orbited. This was the first true communications satellite. It rebroadcast to earth an on-board tape recording of President Eisenhower's Christmas message.

In 1960, NASA orbited the ECHO satellite. The aluminized skin on this 100-foot balloon passively reflected back to earth signals beamed to it from high ground antennas.

Later that year, the military orbited the first active repeater satellite COURIER. This low-orbit satellite recorded and stored on magnetic tape messages from earth along its path, and rebroadcast those messages on command to other stations as they came into view.

[redacted]

In 1962, TELSTAR, the first geosynchronous satellite, was orbited and carried live television across the Atlantic for the first time using an active microwave repeater.

NASA's RELAY satellite followed close on the heels of TELSTAR. It was a more powerful satellite and its elliptical orbit greatly expanded the coverage of TV, data and voice communication over long distances.

In 1963, NASA and the military combined to launch the world's first synchronous communications satellite, SYNCOM. With an orbital period equal to the earth's diurnal motion, SYNCOM appeared to remain stationary from a position in space above earth half the earth was visible.

In 1965, the COMSAT satellite EARLY BIRD, or INTELSAT I was orbited. This geo-synchronous satellite was the forerunner of today's INTELSAT system which consists of over 13 satellites.

Later that year, over the Easter holiday launched the first domestic communications satellite ANIK A-1. ANIKS and its successors have provided communications coverage over the vast territories of the Soviet Union by using an unusual sub-synchronous highly elliptical orbit providing the Soviet Union coverage of movements to the Eastern domain.

In 1967, COMSAT launched the INTELSAT II series of satellites, essentially an upgraded Early Bird with higher capacity. This satellite was intended to provide [redacted] communications coverage for NASA's manned satellite programs. This was followed by INTELSAT III in 1969 which established the initial global satellite system.

In 1968, NASA launched the ATS-1 satellite, the first spacecraft capable of screening a small earth terminal. ATS-3 was successfully followed by the ATS-5, and then three additional ATS satellites all of which failed to achieve orbit. The three failures ATS-2, ATS-4, and ATS-5 were all gravity-gradient satellites, a relatively untried experiment at the time. The two successful ATS's, 1 and 3 were spin-stabilized, a technique which was well-proven at the time, although their on-board satellite antennas were inadequate.

In 1971, COMSAT launched the first of the INTELSAT IV global satellites whose communication's capacity had by this time grown to 4,000 voice-grade circuits or multiple television channels. NASA is also moving forward on an INTELSAT IVA satellite, scheduled for 1975 launch for domestic region service.

In early 1972, the Canadian government orbited the ANIK satellite for domestic communication service

[redacted]

[illegible] in Canada. The AMSC-1 and the Canada's commercial operators to work under and to the for world territories.

In 1974, AMSC-1 and 15 were launched providing the U.S. with its first domestic satellite system. Owned by the Western Union Company, this is the first network of its type under domestic private ownership.

Prior to 1974, when completed the AMSC-1, the most powerful communications satellite ever utilized to put service. This spacecraft has been powered by three of broadcast satellite experiments in the World Federation, Alaska, and Hawaiian.

Costs of commercial systems in the white fields

Although the communication has authorized five domestic satellite systems, only two carriers, Western Union and the case of this time utilized there are satellites. The other American Investing COMSAT proposals provides service to leading satellite headquarters in the Western Union satellites. A fourth authorization has been granted to a case of COMSAT and AT&T, and a fifth is Xerox Satellite Services, a subsidiary of Xerox Aircraft Company. A sixth applicant, GTE, has been authorized to include COMSAT, SBS, and Aetna Insurance and plans a 24-1-36 time frame launch.

Western Union

Recently, the Western Union Company offered AMSC-1, the second satellite to America's first domestic communication satellite program.

Due to costs and checked out, AMSC-1 plans AMSC-1 to complete a satellite service serving the 48 contiguous states, Alaska, Hawaii, and Puerto Rico. AMSC-1, launched part 11, began regular transmission July 31. Each satellite has capable of providing a variety of voice, video, data and graphic communication services. The Western Union ground terminals include five leading and existing earth stations proposed directly from New York, Atlanta, Chicago, Dallas, Los Angeles, San Francisco, and Washington. Each existing carrier is responsible with each transponder capable of accepting voice or signal with accompanying audio.

Available for leasing on AMSC-1 are narrow, wideband channels, TV channels, and entire transponders.

Rates for full transponder service range from $1.2 million per year to $1.27 million per year depending upon hours and other specific terms of the lease.

More than 70 companies already have contracted for AMSC-1 services according to the company.

The launch of the AMSC-1 satellite is the communication system consisting of 12 independent 36-MHz transponder applications. The dedicated receiver system or its applicants investment has a 36a carriers or a 36a for communication or earth, and applicants have before being for or participants and Alaska and Puerto to investing more rates. The first commercial signal to pass for through a ceremony given to the satellite's antennas.

GTE

GTE is presently providing regular service to Alaska through the lease of capacity in its Satcom satellites. The company has also contracted for the satellites and associated services. Since building COMSAT has occasionally operated and financed this microwave links to distribution GTE's 2 to 1 satellite programming private customers, as has been used to begin service in February 1976.

The GTE system calls for the launch of 7 geostationary and one ground spares. Each spacecraft will have 24 transponders of 5 and 6 MHz bandwidth operating in the 4/6 GHz or 12 GHz per channel 2 GHz, providing the coverage area. The primary service is the Satcom line, completed in AMSC-1 and AMSC-2 is planning to the satellite energy which is right electronic and antenna a frequency which drive is a line, the additional power for 12 watts capacity. The launch will utilize four Titan 3 first capacity which are providing a footprint covering CONUS and Alaska. The launch vehicle is an advanced Multi-Delta.

The GTE participation in commercial broadcasting shows the plans the GTE network and five systems on that traffic-capacity using data, all time, the public broadcasting has called to GTE for business. some promotional satellite can be negotiated. Three and others are being used to six years for services of the various configurations of a public broadcasting satellite systems.

COMSAT - and

Three groups interested for launch in 1979-1981 to COMSAT and located in the satellite 3 GHz Marisat, 12 or 14 system, the second will be leasing to Western, and capital for the five, three years of the space. This - Atlantic network. The private also provided with an advanced satellite service and geographic, design space generation services. The Comsat has taken this approach in getting the objectives of the other satellite service industry private line service. COMSAT has switched the 3 to proposed on and-space transponders 3 GHz including with a General Telephone Company (GTE). The General and between other and COMSAT, signed a two-year (GTE), as a phase and lease to provide satellite capacity services. Each exercise GTE's transponder and space, as the exceptional services are four 36-MHz terminals planned.

The satellites will have bi-national capacity and be launched by an Atlas Centaur. This will operate 6 4/6 GHz and 4 GHz and global footprint, one for continental service studies. Aimed at Puerto Rico. An area COMSAT is 36 GHz with time one to five-year 4 aboard aircraft-accompanying beam in the test. The satellite added use of time-provisions to provide the for 12 transponders capability.

The - Cities

Another concept is about COMSAT is participant, in the joint service between COMSAT-Canada, Inc. and Intelsat. This group has asked this to a satellite construction project and then use as international business. GTE participant the Comsat's to participate the company from a 177 COMSAT, Inc. Intelsat ownership, as a COMSAT and. The 12 transponder. GTE proposed to buy and use the Intelsat satellite for participants 36 service. The Delta has received

[redacted]

[redacted]

[redacted]

One of the primary hindrances to the really large scale use of effective programming is the high cost of both the programming and its distribution. By reducing the distribution cost an order of magnitude or more, demand for these materials should increase. This would result in the dual benefits of increased revenues made available for quality programming and reduced per-user cost. Such a mutually reinforcing cycle could result in an explosion of production, use, and quality in this promising area.

V. Optimum Use

Based on the qualitative and quantitative benefits outlined above, we can see that the high-powered broadcast satellite is most cost-effective where some combinations of the following factors occur:

1. There are many users of some information service.
2. The users are geographically dispersed.
3. Some users are isolated from traditional delivery or communications.
4. Mass distribution of information coupled with short-term local buffering (e.g., temporary taping) is acceptable.
5. Some live or very timely production is desirable.
6. Cost minimization is important.

In pragmatic terms, the broadcast satellite in today's situation is best used as a mass distribution system of broadband information generally taking the form of audio-visual moving presentations but also distributing digital data (including computer programs and storage data and computer assisted instruction programs), audio programming (100 to 1,000 times the number of equivalent video programs) and "slide-show" presentations (5 to 50 times the number of equivalent video programs). One or several main uplinks would be normally used, with feasible arrangements for access by any person or institution, either live or tape. Feedback in most cases would be via mails, telephone or handled locally, but certain remote regions could be given two-way service as an expensive but nonetheless cost-beneficial alternative to even more expensive alternatives.

Existing ATS-6 Health and Education Technology experiments and planned CTS (Communications Technology Satellite) experiments have so far emphasized uses in wide distribution of educational programming in schools and universities; for continued education of teachers, doctors and paramedics; for emergency communications, public access cooperative programming, remote medical diagnosis and data exchange, etc. Additional applications for professional education, commercial and governmental data and materials exchange and distribution and others have been conceived. More applications can be expected to materialize as this technology becomes more widely demonstrated, known, and understood.

VI. Conclusions

The high-powered broadcast satellite used in a nationwide, regional or even international system of inexpensive receiver terminals and strategically located uplinks can provide not only micro-economic benefits to individual users, institutions, business and government; but can contribute to the nation's macro-economic problems of productivity, inflation, and living standard. It can most dramatically contribute to the well being of the poorly served remote or rural areas. A vastly increased quality, quantity, and availability of informational services could be triggered. Cost and productivity benefits can be very large wherever there is a need for mass distribution of any of a large variety of services with substantial information distribution responsibilities. Prototype applications using satellites and other communications systems exist and more are planned, yet the potential is still largely untapped.

Appendix A

The following tables illustrate what actual costs would be under a variety of levels of number of terminals using the broadcast, average number of individuals using the material at any one terminal, and number of hours/week being used. The numbers in the cells indicate the cost per individual user hour for delivering the material. Programming and local handling costs are independent of the delivery systems and are not shown here.

For 20 Sites

Hours/Week of Use	Number of Users Per Terminal: 10	50	100	1,000
5	$6.20	1.24	.62	.062
10	3.60	1.12	.56	.056
20	3.30	1.06	.53	.053

For 100 Sites

Hours/Week of Use	Number of Users Per Terminal: 10	50	100	1,000
5	$3.20	.64	.32	.032
10	2.60	.52	.26	.026
20	2.30	.46	.23	.023

For 1,000 Sites

Hours/Week of Use	Number of Users Per Terminal: 10	50	100	1,000
5	$1.30	.26	.13	.013
10	.70	.14	.07	.007
20	.40	.08	.04	.004

THE ROLE OF THE FEDERAL GOVERNMENT IN TECHNOLOGICAL DECISIONS

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The title of this session is "The Role of the Federal Government in Technological Decisions." I mention this at the outset to point out very quickly that I have no hope of being able to cover it. The subject is too large. I hope in the time we have available, merely to nibble around the edges of the topic and perhaps provide some thoughts for further discussion.

To begin with, the federal government does not have a uniform or consistent role in shaping technology. Different agencies act in different ways on different industries for different purposes with different results. The Department of Defense, for instance, makes very important decisions about technology which affect almost every phase of our lives. But it makes them in a very different framework than, let's say, the Environmental Protection Agency which is also concerned with technology.

In order to put some boundaries on the subject, I thought I would limit the discussion to regulatory agencies and their role in shaping technology, especially the regulation of new technologies when they compete with established ones. Since we are interested in communications, I will try to relate it to the Federal Communications Commission.

The conventional wisdom about regulatory agencies is that they tend, more often than not, to retard technological innovation rather than advance it. I subscribe to this wisdom. I think it is correct; but the reasons for it are not as simple as usually supposed. The most familiar explanation for regulatory conservatism is often given in terms of bias on the part of the regulatory agency which favors established industries when they are threatened by competing technologies. There are several reasons or perhaps sets of reasons for this bias. One has to do with the regulators' identification with the industry being regulated. This can range from the ideological--the regulator comes to the commission from the regulated industry--to the crass--the regulator plans to join the regulated industry when his term at the commission is over. Much has been written of this cozy relationship; but the explanation may be more complex than the simple assumption of philosophical bias or venality.

Roger Noll, in a paper called "The Behavior of Regulatory Agencies,"[1] published by the Brookings Institution, discusses some characteristics which cast an interesting light on how these agencies might be expected to react to new technologies.

The paper deals with the institutional arrangements of regulatory agencies; how they are structured, their incentives and how they behave. It maintains that there are certain imperatives characteristic of bureaucracies which shape the kinds of decisions they make. I believe these imperatives explain the apparent protectionist bias of regulatory agencies as much, if not more than the other factors mentioned earlier.

It is to be assumed first that regulatory decisions are the result of rational behavior on the part of the regulatory agency and are designed to advance certain kinds of objectives. First of these is the welfare of the regulator himself. Second, is the welfare of the individuals who are affected by the regulation. Third, is the survival and growth of the agency. Like most human organizations regulatory agencies tend to perpetuate and advance their own interests as well as the objective issues they deal with. Within this framework, all other things being equal, a regulator will tend to promote the public interest. At the same time, however, he is interested in protecting his own income and security and the status and power of the organization for which he works.

Another important characteristic of regulatory agencies is that they operate in a very peculiar environment as far as the government is concerned. Generally, their budgets are small and even the Congressional committees responsible for their oversight do not pay a lot of attention to them. As a result, what they do often gets lost in the shuffle. Unless an industry affected by a regulatory decision becomes unhappy enough to bring the matter to its attention, Congress is usually willing to leave well enough alone.

By the same token a great deal of regulatory activity is insulated from public view. The public is seldom aware of what happens in regulatory agencies unless an incident bursts from the confines of the agency itself into the political arena, the courts, or the market place.

Another aspect of regulatory agencies which influences the way they behave is that much of their activity is quasi-judicial in nature. Decisionmaking often takes place in the context of adversary proceedings between special interest groups. The public is seldom represented. When criticized on this score, regulatory agencies sometimes argue that it is they who represent the public in contests between competing industries. But as noted earlier, the public welfare is only one of the priorities on the regulators' list, and usually not the first.

Within this environment, regulatory agencies find that the best overall strategy from their point of view is one that assures the greatest degree of invisibility. An optimal decision, according to this strategy, is one in which none of the parties to a dispute is unhappy enough with the result to spend the time and money needed to appeal the decision to Congress or the courts. If successful in this approach, Congress will assume the regulators are doing a good job; budgets will be approved, the agency will prosper and commission members will conclude they are serving the public interest.

Noll argues, however, that this perception of serving the public interest is incorrect. Agencies whose guiding principle is not to "make waves" tend to behave in ways which are often contrary to the public interest.

First, the agency will tend to react in favor of the group with the highest per capita interest in the

decision. In most cases this will turn out to be the regulated industry. A television station challenged in a license renewal will have more influence on the FCC, for instance, than a public interest group in which the individual stake is much lower. Even though the cumulative interest of the public sector may be high, the FCC almost invariably responds to the more concentrated interest of the incumbent.

Second, if several groups with strong interests in a pending decision appear before an agency, it will try to arrange a compromise. The object will be to give enough to each contending party so that no one becomes antagonistic enough to remove the issue to an external forum. Since the public is seldom a party to this negotiation, its interest is often not served in the final agreement. Technological innovation is likely to be delayed or diffused by a compromise between the innovating firms and the established ones which are likely to be hurt by the innovation.

Third, when faced with a decision which is very likely to produce an appeal for an external judgment no matter what, the agency will either study the question to death in order to postpone its consequences or try to shift responsibility for the decision to another agency. In both cases the benefits of a worthwhile technological change may be delayed longer than would be socially desirable.

FCC decisions in the past few years in cable, satellites and pay-TV conform remarkably well to the explanation summarized above.

If we judge cable television to be a socially desirable innovation, the actions of the FCC in the past decade can only be seen as a socially undesirable restraint on its development.

Cable television in the United States is about 25 years old. Its emergence followed almost immediately on the heels of the explosion in broadcast television which began in the late 1940's and early 1950's. Cable's main function, well recounted by now, was to improve reception in fringe areas and bring additional television to communities which had only a few stations of their own. It was this latter function which became the basis of the controversy that has dominated the relationship among cable operators, broadcasters, and the FCC for the last ten years. Broadcasters did not complain when cable systems improved the quality of their signals to outlying viewers. They were not nearly as happy, however, when the same cable systems brought in additional channels from other cities.

In the years between 1950 and 1965 several broadcasters sought relief from the FCC against such allegedly unfair competition from cable systems as the importation of distant signals. The FCC declined to act, maintaining during this period that it had no jurisdiction over cable. Except for one decision involving a microwave common carrier's request to bring a distant signal to a cable system in Riverton, Wyoming, the FCC took no steps to protect local broadcasters against cable.

The FCC's lack of activity during this fifteen-year period is worth considering if only because it seems to contradict the familiar wisdom that a regulatory agency always acts in favor of the established industry--in this case the broadcasters. Several explanations are possible. For one, the broadcasters who felt threatened by cable, for the most part, represented stations in small communities. At that time, the broadcast industry was by no means united in its opposition to cable. Many broadcasters and networks were in the cable business. The FCC's failure to act in favor of the small-town stations may have been a simple reluctance to become embroiled in a controversy in which, the FCC felt, it had more to lose than gain by taking sides.

Another explanation for the FCC's failure to act may be considered. Its denial of jurisdiction over cable, in addition to being a tactic for avoiding trouble, may have been legally sound. The communications act under which the FCC has operated since 1934 did not mention cable television; nor had Congress or the courts done anything to imply this authority. This explanation might be conclusive except that in 1965 the FCC decided it did have jurisdiction over cable after all and began a series of rulemakings which has limited the development of cable ever since.

Two things had happened which caused the FCC to change its mind. One, the cable industry had developed to the point where its next logical move was from the smaller towns to the large cities. Now the major market broadcasters and networks began to feel threatened and joined with the stations in the smaller markets to resist the intrusion.

Two, Congress, responding to increased pressure from broadcasters and cable operators, began to consider legislation requiring the FCC to act.

When the FCC could no longer avoid the issue, it began to address itself to cable, but almost entirely from the perspective of its economic impact on broadcasting. Thoughtful people had already begun talking about the great diversity and opportunities for new services made possible by cable. But as Don Le Duc points out in his book on the FCC, "Economic impact was obviously a term which could measure only the threat of cable television, not its promise."[2] The next ten years of regulation found the FCC walking a tightrope between the interests of the cable industry and those of the broadcasters. Their assumption was and has been that if they balanced these interests skillfully enough, the public interest would somehow be served. The assumption is vulnerable on several counts. One, it is not the FCC's business to protect the broadcast industry against competition. There is nothing remotely resembling such a mandate in the Communications Act of 1934. Two, even granting the legitimacy of the FCC's role in trying to protect broadcasters, there is no evidence whatsoever that broadcasters have ever been hurt by cable.

It is interesting to observe whether the FCC, in the performance of its balancing act, has conformed to the kind of behavior predicted by Noll. In any case it is fun to look at it from that angle. Through the 50's and early 60's when the FCC claimed no jurisdiction over cable, it was following the time honored principle of "why look for trouble?" Since the small-town broadcasters who felt aggrieved by cable did not have the clout to force action, the FCC could safely look the other way. When cable began to penetrate the major markets, the larger broadcasters became nervous and forced the FCC to act. The major issue was importation of distant signals. Faced with a need to make a decision, in 1965 the FCC began a series of inquiries and rulemakings which in effect froze the development of cable in the major markets until the beginning of the next decade. The FCC accomplished this by establishing a complicated set of rules for signal importation which in essence gave control of the regulatory process to local broadcasters.

After seven years of agitation by the cable industry, the FCC finally issued a report and order in 1972 which to its way of thinking represented a fair compromise

between the interests of the cable operators, the broadcasters, and presumably, the public. Cable systems, depending on whether they were in the top 50 markets or the second 50 markets, could bring in at least two and possibly three distant signals. Importation of signals was complicated further by additional restrictions involving leapfrogging and program exclusivity contracts.

Most of Noll's predictions concerning regulatory behavior such as bias in favor of the most concentrated special interest, tendency toward compromise, proclivity for delay and avoidance of hard decisions whenever possible, are amply demonstrated by the history of the FCC's cable deliberations.

The process continues unabated in the issue of pay-cable. Cable systems interconnected by satellite and terrestrial microwave offer the hope of vastly increased program choice free of the restrictions and interuptions of advertiser supported television. Broadcasters, predictably, are bitterly opposed to pay-cable while cable operators claim that without it their industry is doomed to stagnation. The FCC threads its way through this mine field and arrives at a compromise which satisfies no one, but just might survive a challenge in the courts or in Congress.

The compromise is that pay-cable is permissible but that the programming fare is severely restricted by a complicated set of rules regarding the age of movies that may be shown, the kinds of sports that may be telecast and the types of program formats that may be used.

The rationale behind these restrictions is that pay-cable should not be permitted to "siphon off," i.e., outbid the networks, for programs or classes of programs which have previously appeared on broadcast television.

In the case of live coverage of nationally significant events like the Super Bowl the FCC may have a point. But in the case of feature films, at least, it is hard to think of any defensible reason why the FCC should determine how the public watches its movies--whether on broadcast television, pay cable, theater screens, or some combination thereof. Yet, the FCC has decreed that a pay-cable system may show a movie only if it is less than three years old or more than ten. If it is more than ten years old, it still may not be shown if a local station has broadcast it within the last three years.

The FCC, by perceiving its function as that of arbitrator between the industries which appear before it, neglects the interest of the public whose concerns are more diffused and therefore less well represented. In the process the FCC slows the development of newer technologies and delays the public's enjoyment of their potential benefits.

It is unfortunate perhaps that in a discussion of the federal role in technological decisions, I have chosen an example in which the federal role has been to stifle rather than encourage innovation. Other examples might have shown exactly the opposite effect. It is possible, for example, to trace a direct chain of development from the Pentagon's need for subminiature components in its missile guidance systems to the ubiquitous and increasingly inexpensive pocket calculator. I wish we could predict an equally happy outcome for the development of broadband communications.

[1]Roger G. Noll, "The Behavior of Regulatory Agencies," Technological Change and Welfare in the Regulated Industries, The Brookings Institution, Washington, D.C. 1971.

[2]Don Le Duc, Cable Television and the FCC: A Crisis in Media Control, Temple University Press, Philadelphia, Pa., 1973.

SATELLITE COMMUNICATIONS: THE GLOBAL PROSPECT

presented by

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The communication satellite is, of course, obsolescent. In ten years it may even be obsolete; certainly, it will soon be passé. The elevated needs for communicating come and go. Every new technological device is heralded as a breakthrough, a marvelous instrument certain to improve if not perfect human communication needs in countless ways, many of them not yet imagined. Educators are forever sponsoring conferences to consider and extol the future and indubitable social benefits to be realized from the gadget of the moment. This could well be 1974, and I had been asked to speak about the miracle of wireless broadcasting rather than the communication satellite. Then as now there were conferences and speeches about the latest technology for better communications; then as now, the Sex Ohio quotient was unacceptiewably high.

And why not? By 1929, ten years after Professor Terry commenced broadcasting by wireless at the University of Wisconsin, a national magazine was anthusing that "radio is lifting us to heights when the mass mental vision is broader than ever before in the history of the world." Only a computer could count the number of prophets, mostly academics, who 25 years ago proclaimed that television would prove a wondrous "window on the world." I was myself among those faithful optimists who professed to discern civilizing propensities in the ECHO balloons and TELSTAR repeaters of some 15 years ago. We should have heeded the sagacious advice of Satchel Paige: "Do not look behind you, as they may be catching up."

This is simply to suggest that the ghosts of countless Conferences Past are present in any current convocation focusing on the trendy communications hardware of the moment. For mortal survivors of all those conferences, the sense of deja vu must be overwhelming. There is something valuely American — that is, compulsive and ritualistic — about these solemn meetings called to consider the "ramifications" and "implications" for society of the latest gadget — the product, typically unsolicited, of our colleagues of Technology. For whatever it may suggest, this address does not use "input" as noun or transitive verb, nor does it declare an "innovative" any putatively novel uses for patently traditional communications devices.

We tend to become obsessed with the gadgetry of communication in its technological mystery, to be fascinated to the point of absorption with the artifact qua artifact. Required, clearly, as a matter of priority is rumination on the urgent social considerations implicit in the glistening new engines of telecommunications. We should require some kind of "human impact" statement or forecast before permitting the proliferation of communicative technology. For this is a technology with gross, multiple impact probabilities; it is, it seems to me, among the most critical areas of social concern before the global community in the late 20th Century. Specifically as to communication satellite-viable technology, we are duty-bound to have our collective eye on the main chance, i.e., to assess with specificity the uses to which this technology can be applied or brought to bear on the pressing problems of the human condition.

Well-known and universally applauded are various contemporaneous applications of manmade satellites: meteorological, navigational, geological resources surveillance. Already the photography enabled by the U.S. LANDSAT Earth resources satellites promises immediate and substantial benefits for the agricultural and economic development programs of such countries as Niger and Bolivia. The Washington - Moscow hotline based on cable and radio systems is to be augmented by linkages involving the Soviet Molniya III satellite network and the Intelsat IV system. And surely one of the most exciting portents for the immediate future of mass communications is the use of a satellite to transmit facsimile pages of the Wall Street Journal from a composing plant in Massachusetts to a printing plant in Florida.

But as we view the global prospect of satellite communications there stand out certain indurable barriers impeding the fullest realization possible of the potential we posit for this mechanical artifact. I cannot believe that these barriers are insurmountable. Indeed they must be overcome if we are to achieve even a fraction of the many dividends we consider due from the communications satellite in the service of mankind. Yet far too little is understood of these vexatious problems and issues created by the satellite technology as applied to communication in its manifestly diverse uses. This, therefore, is why I suggest for consideration the following obstacles to our fullest use, in international dimensions, of the communication satellite:

1. The lack of global coherence in addressing the ideological and related issues resulting from the satellite communications technology.

This is a direct consequence of the impetuous — or ineptitude — of the international bodies under presumptive mandate to consider and, as possible, ameliorate these issues. There is a reluctance, ill-founded, I believe, to discuss openly this failure of will and of effort among these few organizations. As I learned to my sorrow and frustration while serving as Unesco's first senior program specialist for space communication, the specialized agencies of the United Nations have neither the expertise nor the initiative to pioneer the necessary pathways leading toward resolution of issues extraordinarily difficult problems. (This is not say that competent, dedicated professionals are not to be found in the UN organizations. Among precisely such functionaries one distinguishes Josef Nichols, Special Assistant for Communications

Planning in the IT's New York headquarters; Krishnaswami Venugopal, Rural Radio Specialist in the World Bank's Education Department; and R. Lloyd Kimmerle, an Australian scientist exchanged who succeeded me in the Geneva satellite post, will no find the killer signal lost to disciplined action of the Organizations' administrators. Unfortunately, without compromise and motivation as displayed by those who said yes (two of their associates to did work for the imperative retirement of their political-connections expertise to take the inevitable airline secretaries of the specialized agencies are to cope meaningfully with the complex issues of space communications.)

The fact is that the 19 specialized agencies do presently understand and evidently do produce the solutions for removing the barriers to a truly international agreement on the use of satellite communications for social and economic development on a global scale. (Spearheading this situation is the success of the politicians of the agencies in overriding politics "private leaders" of the citizen and cooperation of years fellow international bureaucrats.)

I believe, and have on urged since 1971, that there ought to be a rearrangement of the 19 bodies most concerned with satellite communications. It was at the Conference on Communications in January 31 at the Seattle World's Fair that I first proposed establishment of a United Nations Space Communications Organization. The week, as I have elaborated on in a recent article in the British publication, Space (Jane) Broadcasting International, is to coordinate the present 19 mechanisms for space communications efforts. My Geneva experience, together with a research project I carried out at the 1971 World Administrative Radio Conference for Space Telecommunications in Geneva, have convinced me that the present random distribution of satellite communications responsibilities among several 19 agencies is inefficient, cumbrous, impractical -- and unworkable. The International Telecommunication Union is, as we have, responsible for spectrum-frequency and allied technical aspects of international and space broadcasting. Unesco is, or was, responsible for both legal-regulatory and educational-social development concerns. In addition, such specialized agencies as the Food and Agriculture Organization, the World Meteorological Organization, the UN Development Program and of course the UN General Assembly together with the New York Secretariat are all, to varying, typically overwhelmed, ways concerned with satellite communications. I suggest that a single agency, created by the General Assembly specifically for the purpose of considering and clarifying the present diverse functions and responsibilities of many agencies, would be a welcome complement the UN's limited resources of expert personnel who can formulate policies and execute plans to use the communications satellites for purposes widely peaceful and useful. The bewilderment of educational and other policy makers in developing countries in search of guidance on satellite matters is understandable, given the present kindgrunch of 19 agencies and bureaucrats claiming various and frequently conflicting responsibilities for dispensing such guidance. A freshly-created UN Space Communications Organization, comprising the Geneva offices and in being, and responsible for all technical as well as developmental matters, might just improve the situation.

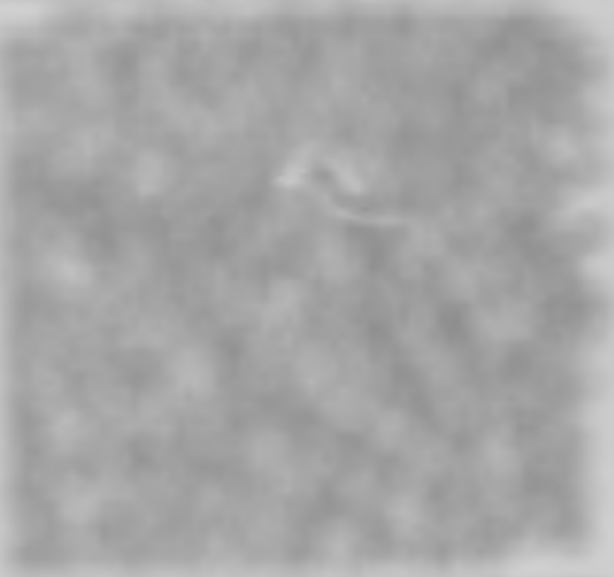
In be, I suggest, an coincidence that to accept more most of the groundbreaking suggestions for achieving global agreement on how to use the communications satellite technology have resulted from the conferences, workshops and publications sponsored by non-governmental bodies devoted to analysis of the issues. The Ohioan of the Interamerican Broadcast Institute, based in London, which be to the forefront of the world effort to bring together for scientific study of the tough, complicated problems presented by the technology the scholars, government specialists and international public servants directly involved in putting the satellites in use for real-life purposes. Likewise, the Aspen Wave Center has been instrumental in forcesee of educators and create leadership to applications both direct and potential, and of course also the problems, stemming from the Aspen2 assessments. The International Institute for Mass Communications Research, with a membership consisting of scholars from throughout the world, has sought to stimulate discussion of communications among those of an identified as specialists in nine fields, regardless of ideological or sociopolitical approaches. Two years ago, as I shall elaborate below, as the practical level to be a small number of regional groups that are forging ahead with what prime as on the most demonstrably significant progress with respect to applying the technology to furtherance of socially desirable ends.

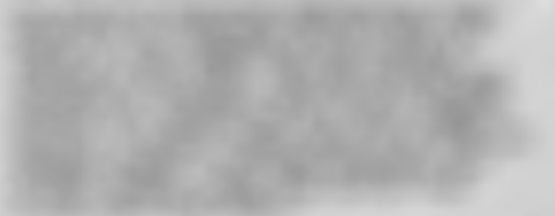
A second barrier to global utilization of the satellite technology is the following:

2. The lack of coherence among policy-oriented for the application of satellite communications to programs of social and economic development.

The inability, on the occasions, of the responsible UN agencies to codify and systematize worldwide applications of the technology has resulted in a lamentably burdensome array of national, regional and global schemes for employing the satellites in overall development programs. To be sure, there is today's widely-admired of opportunity -- experiments with programs. But I wonder if at least some of the praise lavished upon this project by the Twenty Nations arrivals by the needs of consumer appreciation of the reasons for being. Certainly, the Satcom communications satellites project was approved and launched without benefit of adequate experiential insight. There was no significant backing of experience gained through experimentation in other, more suitable countries, but prone to caution, some inspirationally and culturally "difficult" countries. Already there are signs that this over-ordered project be running afoul of the competing patterns comprising the Indian government's territorial bureaucracy. If so, the results will be disappointment and chagrin. India's geographic demographical and linguistic diversity -- among other negative factors -- suggest that reliance on "one-national" educational broadcasting should have been ruled by many years the acquisition for prestige purposes of a satellite orbital opportunity for social-improvement broadcasting.

A country such as Indonesia, on the other hand, would make an ideal laboratory for putting communications satellites to work in educational television programs. The Indonesian domestic satellite not only will serve to provide superior communications linkages among that nation's island-dwelling millions but also should make the eradication of illiteracy in terms of the technology a realizable goal. In the same time, however, Indonesia also provides us with a graphic example of why enthusiasm for the gadgetry of the satellite technology must be counterbalanced with considerations of the human factor. Bringsveri Venugopal of the World Bank has pointed out, for





of that $45,000,000. The question is: would it not have been better to have set up a private microwave or a microwave system to feed these communities? Our answer is, if it's better, why hasn't somebody done it? The technology is there, and the reason they haven't done it, in our judgment, is because the market isn't there. You're not going to put very many microwaves into a community with 31 people because there's not going to be anyone in that community to pay for it. You're not going to put very many microwaves into the middle of a Navaho reservation where kids ride buses for 2½ hours one way, every day. The private sector of our economy is not going to do this. You'll have trouble getting a price quote. The other thing about a terrestrial system is you not only have to build it, you have to maintain it. A terrestrial system constantly has to be maintained, that means, you've got to be able to reach those mountain tops, that means you've got to have snow cats to go up there, you've got to have people out there. Our answer is that we think the technology of the satellite is more efficient, economical and a better way to go. If microwave is better, that's the way we ought to go; but we don't see the evidence that that's the case.

Question: What happens if that satellite doesn't come back from India?

Answer: This was a demonstration project. We understood all along that the satellite was going to India. The purpose was to demonstrate feasibility. This is why I urged you earlier to take a look at the final reports. These six experiments were put in place to find out if there is a national policy direction that we ought to move toward. This was seed money. Some have said it was carelessly sown, and the crop that raised was not productive. I don't think the final decision is in on that yet. It's a demonstration, and if the satellite does not come back, the costs are going to be exceptionally high. But, if we could amortize these costs over seven years, those costs would come down. We have never claimed that this project was cost effective.

Question: I'm interested in knowing if you had an eye on the future of possibly utilizing some of the transponder space that will be available from Western Union, RCA and the others?

Answer: We don't in our project. As far as our future is concerned at the STD, we see a wind-down of this project. Let's face the reality that the Satellite Technology Demonstration is coming to an end. Operationally, it's ended. It will phase out over the next 60 to 90 days. Our position at the Federation of Rocky Mountain States is that ATS-6 will return from India and we should get ready. We're putting all of our eggs in two baskets, neither of which you mentioned. The return of ATS-6 and the Public Service Satellite Consortium, which is going to be discussed in another presentation. That's a new entity in which the Federation has been very active. You have to understand the Federation's role in life is to innovate, to identify regional problems, and to help solve those problems. We have shown in the region a way we can deliver health, social and educational services to small, rural isolated communities in the region. It's time for somebody else to do this because the Federation does not want to remain in an operational role any longer.

Question: Will reports be available?

Answer: Yes, there will be a series of technical reports. They run 6, 8, 10, 12, 14 pages in length covering technical activities, programmatic, administrative, a whole gamut of matters that we thought important. There will be a comprehensive report which will not be available for general distribution. There will be a 30-page popular report, and an 8-page brief down of that.

Question: Is there any insight you can give us about a project of this magnitude and having to deal with the Federal Government--what kinds of problems as an experimenter if we were going to get involved in experimentation, what we would anticipate and maybe how we might be able to overcome some of those problems?

Answer: If I had any sense, I'd take the fifth amendment on this one. Just good old basic principles. Get it in writing. Establish mutual trust. That's very important. Insist that your funding agency monitor the project, that they really monitor the project. The history of this in our satellite project has not been a happy one. I would say that when you do this type of project, identify your objectives clearly, make sure that the project staff and project director understand what those objectives are, and make sure that the funding agency understands and agrees. And the one thing that you cannot let happen is that the agency cannot sit in Washington and change the ground rules. You're dead if you let that happen. So, get it in writing, have a clear concise understanding of where you're all going. Develop a good rapport, a good working relationship. We have this with some people, we don't have it with others. I'm being brutally frank about all of it. And, finally, insist that they do their part of the job which is to monitor. Don't try to do it with inadequate budget. You're kidding yourself. This does cost money. Don't say we can shortcut. I don't think you can.

The Appalachian Education Satellite Project (AESP), which developed and delivered a series of graduate courses to almost 1200 educators throughout Appalachia, is the focus of this symposium. The project was made possible by a grant from the National Institute of Education and by the cooperative efforts of the Appalachian Regional Commission, the University of Kentucky, and Regional Education Service Agencies in eight Appalachian states.

The televised courseware components were delivered using NASA's ATS-3 and ATS-6 satellites. The programming for the project included the first live interactive televised seminar by satellite and the first televised programming by satellite received at dispersed classroom sites using inexpensive ground reception equipment.

In the symposium, which featured Dr. Lawrence P. Grayson of the National Institute of Education as moderator, participants told the story of the project through a series of presentations. Dr. David L. Larimore, Director of the Resource Coordinating Center (RCC) at the University of Kentucky, began by providing a project overview. A description of the AESP equipment configurations was then presented by Dr. William J. Bramble, Director of Evaluation at the RCC and organizer of the AESP symposium presentations. Next Dr. Lowell Eberwein, Director of the Reading Course Development Component at the RCC, described some of the program development strategies used in the project through the example of the Diagnostic and Prescriptive Reading Instruction Course. Dr. Frank V. Colton, in charge of the Four-Channel Audio Instruction Component at the RCC, explained how the AESP used the four-channel audio capability of ATS-6 for a learning activity similar to programmed instruction. Dr. Bramble then gave a summary of results for the experiment through the first year-and-a-half of operation. A final presentation was given by Dr. William Brish, project director at the cooperating Regional Education Service Agency in Cumberland, Maryland, who related his involvement with the project from the receiving end and discussed the implications of the project for the ultimate consumer - the Appalachian student. In so doing, Dr. Brish drew upon his rich personal experience with the project and that of the many educators in Maryland and the other seven states who were involved in the project.

Papers based on the presentations of Drs. Larimore, Bramble, Eberwein, and Colton follow. Co-authors are included where appropriate to reflect the efforts of others on the project staff who contributed in a major way to the development of the symposium presentations.

THE ROLE OF THE RESOURCE COORDINATING CENTER IN THE APPALACHIAN EDUCATION SATELLITE PROJECT

David L. Larimore
Diane T. Maynard
University of Kentucky
Lexington, Kentucky

The launching of the Applications Technology Satellite Number 6 in May, 1974, signified the beginning of the use of communications satellites for educational television purposes. One of the three educational users of ATS-6 time was the Appalachian Education Satellite Project (AESP), which, by means of satellite transmission has offered four graduate-level teacher training courses in career education and elementary reading to 1200 teachers in eight Appalachian states.

In July, 1974, AESP inaugurated ATS-6 communication with the first ETV graduate-level program by satellite and later, with the first live, interactive seminar by satellite, but work on the project began much earlier. In 1970, a survey conducted by the Appalachian Regional Commission revealed that Appalachian teachers wanted more in-service training in reading and career education. When the commission learned that ATS-6 transmission time would be available for educational use, a program was planned to utilize the capability of such a satellite to deliver training programs to people in an area which includes many relatively isolated, inaccessible communities.

As part of this program ARC chose five main Regional Education Service Agencies within the satellite's transmission area to implement the project on a local level. Two ancillary sites for receiving satellite transmissions were affiliated with each main site, for a total of fifteen receiving sites where teachers could meet for "classes" via satellite.

In addition to choosing RESAs the Commission selected a Resource Coordinating Center to develop, produce, and evaluate all software and programming for the four courses offered. For a number of reasons the ARC decided to choose a university as a Resource Coordinating Center. Most important was the fact that many universities would already have most of the necessary people and physical resources needed to develop software particularly appropriate to the technology available. Eleven institutions chose to respond to ARC's request for proposals. The University of Kentucky in Lexington was chosen as the Resource Coordinating Center.

The success of the University of Kentucky's participation as the Resource Coordinating Center was a direct result of the support of the university administration and the cooperation among faculty. The decision to develop a proposal for ARC was a cabinet level decision. The team that convened to write the proposal and do the initial planning represented a broad university base and included representatives from: computer applications, Media Services, research design, reading, career education, information systems, and instructional design.

Organization of the proposal into missions prescribed a management structure of components for the RCC.

The six components of the RCC included: reading, career education, instructional television, four-channel audio, information systems and evaluation.

The reading component was responsible for the development of two courses in diagnostic and prescriptive reading instruction. The first of these two courses was broadcast in the summer of 1974 to an audience of kindergarten through third grade teachers. Each of the twelve sessions of the course incorporated such learning activities as half-hour videotaped instructional programs, fifteen-minute four-channel audio instruction, ancillary instructional materials, and evaluation activities. In addition, four times during the course students participated in a live interactive seminar in which they had the opportunity to query course designers and experts in the area of diagnostic and prescriptive reading instruction.

In the spring of 1975 a second course in diagnostic and prescriptive reading instruction was offered. The audience for this course was kindergarten through sixth grade teachers. The course used the first as a building block and added seven new videotaped television programs. Ancillary materials, live interactive seminars, and four-channel audio segments were revised to reflect the audience changes. In each of these courses the component was responsible for script and ancillary materials development. The Component Director also insured that these courses met academic standards for the University of Kentucky and other cooperating universities which granted three hours of graduate-level credit for each course.

The career education component had similar responsibilities for the two courses in career education. The first of these two courses was offered in the summer of 1974 to an audience of elementary school teachers. Like the first reading course, the format consisted of 12 half-hour videotaped programs, supplementary instructional materials, and four live interactive seminars.

The fall of 1974 marked the introduction of a career education course designed for secondary school teachers and administrators and composed of 16 hour-long live interactive seminars. Students were able to interact with noteables in the field of career education and communicate questions to seminar participants through radio and teletype hook-ups (via satellite) with the studio.

Important to course development was the television component which produced and delivered 41 half-hour videotaped programs, 28 live interactive seminars, and 26 fifteen-minute four-channel audio programs. The television component was part of the Media Services division of the University of Kentucky and used its facilities and personnel. Producer-Directors with this component worked closely with subject matter experts to plan and develop each television program. Field filming from exemplary programs at sites suggested by each of the five main RESAs was incorporated in the programming.

Two supportive components were incorporated; these tested the communication capabilities of the satellite and insured the success of the courses. One was the four-channel audio instructional system which was used to reinforce learning in the video programs. Each participating teacher was equipped with head phone sets and a console with four response buttons. After receiving programmed audio instructions in the form of a hypothetical description of a teaching situation and four alternative approaches to the problem posed, the teacher selected a response by pushing a button. The teacher then heard pre-recorded feedback which reinforced the selection of the correct answer or corrected any misunderstanding if an inappropriate response had been made.

Another major component unique to the Appalachian Education Satellite Project was the computer based information system which employed a combination of computer-based and manual information systems for storing, retrieving and delivering to teachers in their communities information and instructional materials in areas of reading and career education. In-service participating teachers asked for information by specifying grade, subject area, objectives, and the nature and diversity of the students in the class they were teaching. Requests were relayed via satellite to the RCC where they were processed. Using the satellite to reduce turn around time, the teachers were forwarded lists of activities and resources for both themselves and their pupils.

To insure that the results of the project met the intended goals, formative and summative evaluation processes were incorporated in the evaluation component. The formative evaluation process monitored the design of each course. The unit was also responsible for designing pre- and post-test measures of teachers' learning increments, attitudes, and teaching methods. A follow-up study measured the impact of the teachers' participation on their classroom teaching methods.

Indications of the success of the Appalachian Education Satellite Project are found both in the viability of the model it demonstrated and in the use of the products the project developed. All too often big projects with big plans and money end up as relics or curiosities; the University of Kentucky and the Appalachian Regional Commission were very concerned about the long-term potential shown for satellite use and the shorter term use of the materials developed by the Project. To meet the short-term concern each main RESA was provided with video cassette copies of programs which may be used for in-service training with AESP participants serving as lead teachers. Colleges and universities may use tapes to offer courses or to supplement classroom instruction. A consortium of higher education institutions working with the educational television network in Kentucky offered the course for graduate teachers throughout the state. The Tennessee statewide reading program broadcast the Diagnostic and Prescriptive Reading Instruction course to all teachers in grades 1-3 in their state. These are examples of a few of the many ways AESP has contributed to educational technological advances.

AESP EQUIPMENT CONFIGURATIONS

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A variety of sophisticated communications equipment was used for the Appalachian Education Satellite Project. The equipment consisted of two NASA communication satellites and an extensive array of ground equipment. Some of the equipment was associated with satellite broadcasts, and some was independent of the satellite communications systems.

NASA Communications Satellites Used for the Project

Two satellites from NASA's Applied Technology Satellite series, ATS-3 and ATS-6, were used in the project. ATS-6, the last in the Applied Techology Satellite series, was launched on May 30, 1974, with a Titan IIIC launch vehicle. To date it is the most sophisticated communications satellite ever launched. The most important feature of this satellite is that the power is in the sky. That is, rather small ground antennas can be used to receive signals from the satellite. Formerly, very large antennas had to be used with communications satellites since their signals were very weak. The ATS-6 satellite was designed for many different kinds of experiments. Besides those in health and education, there were meteorological and navigational studies. The Appalachian Education Satellite Project was one of six

communications experiments in the health and education fields using this satellite. The ATS-6 satellite looks rather like a large umbrella in space. It has a 30-foot nylon mesh antenna. It is in synchronous orbit above the equator near the Gallapagos Islands.

The ATS-3 satellite was launched in 1967 with an Atlas Agena launch vehicle. The satellite can receive and transmit voice and data mode communications in the VHF band. Like ATS-6, ATS-3 is in synchronous orbit over the equator and carries equipment for a variety of scientific experiments.

For the Appalachian Education Satellite Project ATS-6 served primarily to receive and retransmit signals in the S band for the color video broadcasts from the Resource Coordinating Center in Lexington, Kentucky, to the various classroom sites located in the Appalachian region. Because of its multi-channel audio capacity, ATS-6 was also able to receive and retransmit to the classroom sites the four-channel audio review lessons described in the paper by Frank Colton and Alice Martinson. ATS-3, which was available more often than ATS-6, was used for voice and data mode communications during both the interactive seminars for questions transfer and at regularly scheduled periods for intra-project communications.

Major Communication Links

In Figure 1 is shown the delivery system for videotaped programs and live, interactive seminars. These programs originated at the broadcast studio at the Resource Coordinating Center in Lexington, Kentucky. They were transmitted by landline to the access station at Rosman, North Carolina. The signals were uplinked to ATS-6 for rebroadcast to the classroom sites. The four-channel audio review programs were uplinked to ATS-6 from the station at Morrison, Colorado, for rebroadcast to the classroom sites. The uplink at Morrison, operated by the Federation of Rocky Mountain States, also served as the backup station for videotaped programs.

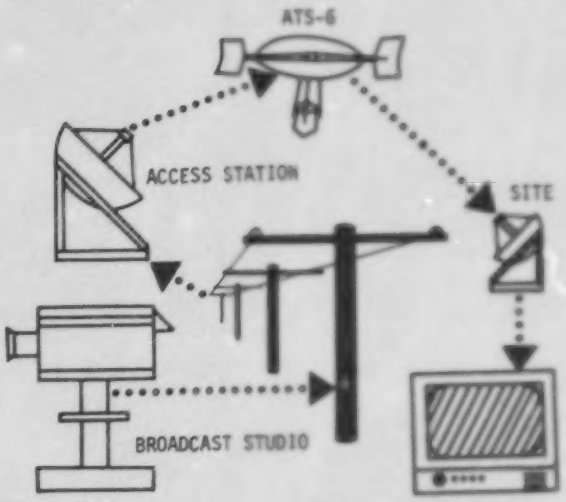

Fig. 1 -- AUDIO-VIDEO DELIVERY SYSTEM

Figure 2 shows in detail the downlink for the video transmission from ATS-6 to the classrooms. Both the television signals and four-channel audio signals were transmitted by this satellite to the classroom sites. Also shown in Figure 2 is the parabolic antenna located at each classroom site. These antennas were only 10 feet in diameter.

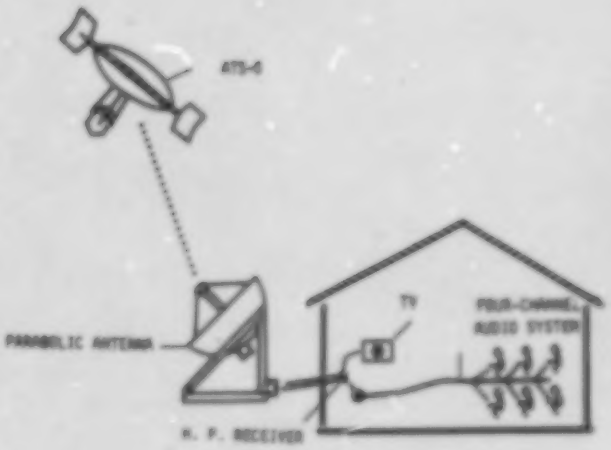

Fig. 2 -- SITE AUDIO-VIDEO AND FOUR-CHANNEL GROUND EQUIPMENT

In Figure 3 is shown the transmission configuration for seminar questions transmitted from main sites or ancillary sites in the region to the broadcast studio at Lexington, Kentucky. Only the main sites had transmission equipment allowing them to transmit questions in voice or data mode (teletype) via satellite to the studio at Lexington, Kentucky. Questions from ancillary sites were transmitted to the associated main sites by a landline teletype connection for broadcast to Lexington by way of satellite. The antennas used for transmission and reception of voice or data mode signals to or from ATS-3 were the helical (corkscrew-shaped) antennas depicted in Figure 3.

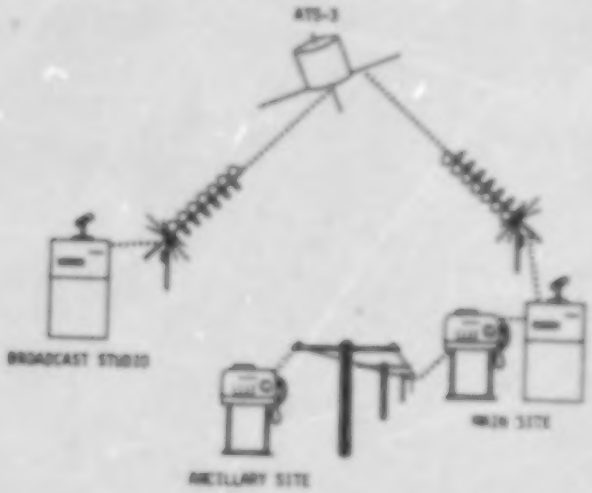

Fig. 3 -- VHF-TELETYPE RELAY SYSTEM

Coverage Area for AESP

The white area on the map in Figure 4 is the Appalachian region. Fifteen classroom sites throughout this region were chosen for participation in the project. The sites were arranged in five triangles containing three sites each. In each triangle there was

a main site and two ancillary sites. Main sites were located in Fredonia, New York; Cumberland, Maryland; Norton, Virginia; LaFollette, Tennessee; and Huntsville, Alabama.

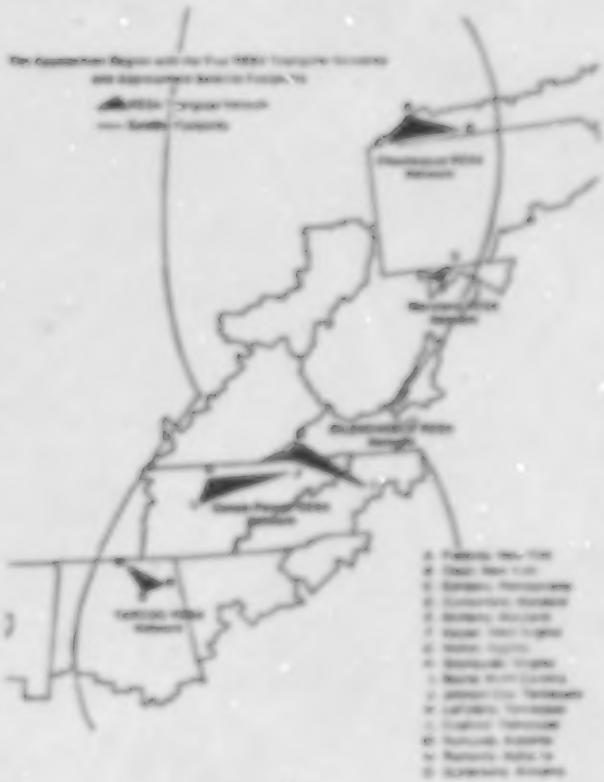

Figure 1

Ancillary Sites

Ancillary sites were receive-only terminals as far as satellite communications were concerned. That is, they could receive via the ATS-6 satellite the video-taped programs, live interactive seminars, and four-channel audio instructional units. They could not receive or transmit using the ATS-3 satellite, but were connected by a landline teletype to an associated main site which was able to use the ATS-3 satellite. In addition to the teletype machine, equipment at an ancillary site included a 10-foot parabolic antenna, a preamplifier, a Hewlett Packard receiver, a color television monitor, and earphones and response pads for the four-channel audio instruction. Ancillary sites were also equipped with portable microfiche readers and classroom libraries containing materials for laboratory sessions. All 15 classroom sites, whether ancillary or main sites, had facilities to accommodate at least 20 students.

Main Sites

Main sites were equipped in the same way as ancillary sites, except that they had some additional equipment. The additional equipment consisted of the helical antenna used for transmission and reception of audio signals via the ATS-3 satellite, the associated UHF broadcast and reception equipment for voice or data mode transmissions, and equipment to record on magnetic tape the responses of students to the four-channel audio instruction. Main sites were in contact with each other and with the KCC in Lexington, Kentucky, by way of the UHF communications system. In addition, telescripters were located at all main sites and the KCC for quick transmission of printed copy.

Resource Coordinating Center

The Resource Coordinating Center in Lexington, Kentucky had all equipment present at a main site. Both television and four-channel audio transmissions from ATS-6 could be received by the studio at the Resource Coordinating Center in Lexington, Kentucky. Voice and data mode transmission-reception via ATS-3 was possible. In addition, the equipment necessary for producing the 30-minute videotaped programs and 45-minute live interactive seminars (all in color) was located at the University of Kentucky TV studio. Production equipment for four-channel audio tapes described in the paper on four-channel audio instruction was also located at the KCC in Lexington. Computerized information search packages, available for information retrieval, were run in Lexington for students in the RDSP courses. Equipment for decoding tapes containing the responses of students to four-channel audio instruction was located at the KCC.

How well did the systems used for transmission and reception of the Career Education and Reading courses work?

Based on the data for the prestaged programs and the live interactive seminars transmitted during 1976, the TV delivery system reliability was 90%.

Transmission problems occurred during 8% of the programs (4 out of 48), and reception problems occurred 2% of the time. The transmission failures occurred on two fronts: one problem was due to a malfunction in the telephone link between the broadcast studio in Lexington, Kentucky, and the uplink in Rosman, North Carolina, and another was due to a failure in the power generator at the satellite uplink station at Rosman. Various problems with classroom site equipment made reception of programs impossible at individual sites for 2% of the broadcasts.

How Well Did the UHF Audio Transmission-Reception System Work During Seminar Presentations?

In the presentation on the RDSP course by Ebenezer and LaVeaque, the use of student questions in the seminars is explained. Questions were relayed from ancillary to main sites via landline teletype. From the five main sites the questions were transmitted to the broadcast studio via two-way radio using ATS-3.

UHF reception at main and ancillary sites (broadcast standards 9% of the time. UHF reception at the KCC met broadcast standards 91% of the time. The lower reliability of the broadcast studio was due to initial problems with local radio interference. All data on equipment reliability are from the first seven months of operation (June - December, 1976).

RDSP READING COURSE DEVELOPMENT

Lowell Ebenezer

Paul LaVeaux

University of Kentucky

Lexington, Kentucky

The Diagnostic Prescriptive Reading Instruction course (DPRI) was specifically developed for the needs of Appalachian teachers. General descriptors for course development were identified by the Appalachian Regional Commission (ARC). These descriptors stated that the course should be for elementary teachers, carry graduate credit, show diagnostic and prescriptive reading techniques, and focus on developmental rather than remedial

reading problems. The RRC also specified that the course would include half-hour television programs, five 60-minute seminars, audio review questions, ancillary materials, and a criterion-referenced test. These decisions set forth the general structure for course development.

The nucleus of the series was twelve half-hour television programs. The series used a modified "documentary" approach to present the course content. The half-hour programs were studio based, utilizing a high percentage of film shot in classrooms throughout Appalachia. By using location film, the boundaries of the conventional classroom were extended to let the student observe fellow teachers across the Appalachian region. More than sixty teachers from a nine-state area were included in the series.

A good working relationship was established between the television producer-director and the reading component director through developing boundaries of decision making. The producer-director made production decisions while the reading director made content decisions.

The production team decided to use the course content expert (the reading component director) rather than a professional actor as the on-camera presenter. It was felt that the content expert would have greater audience and professional credibility. Because of the absence of an on-site instructor, the use of the content expert on screen would give the teachers someone with whom on the local scene, not only on the professional or academic level but also as a television viewer. Additionally, the content expert could conduct on-camera interviews with the teachers filmed and moderate the five seminars. This procedure helped to add a greater sense of continuity between ancillary materials, five seminars, audio review questions, and the television programs.

Moreover, because of the short time line using the content person in this way helped to simplify production planning and scheduling. Admittedly this made the content person's task more demanding. However, discontinuity gained through integration of the program content in all phases of the RRC series made up for the inconvenience caused.

For the diagnostic portion of the course a mixture of studio and location film segments supported by graphics was used to explain and demonstrate diagnostic techniques. In the programs on prescriptive teaching techniques, a modeling approach was used with Appalachian teachers as role models. The unique feature of these programs was that the course content was presented by classroom teachers rather than by an authority figure. A teacher was first shown applying some instructional technique in the classroom, and then interviewed to explain why that technique was effective. Using teachers to present course content proved to be an effective instructional procedure.

The production method included a series of recurring and concurrent steps. Production first started with the generation of program content and ended with a final, modular program. The steps included in production were:

a. Assess Field Needs
b. Develop Tentative Course Outline and Production Approach
c. Circulate Tentative Outline to the Field
d. Revise Course Outline Based Upon Field Suggestions
e. Review Research
f. Identify Exemplary Field Teachers
g. Develop Program Script
h. Circulate Scripts to the Field
i. File in Field
j. Production
k. Post Production
l. Develop Ancillary Materials

a. Increase Line Seminars

A summary of the various activities undertaken to each step follows:

Assess Field Needs

The initial assessment of field needs was made by reading educational publications of the Appalachian Regional Commission, nationally published articles on Appalachian children, and reviewing the New York State Department of Education in-service Reading Program.

Develop Tentative Course Outline and Production Approach

A tentative course outline was first developed based upon the needs of the Appalachian region, current trends in diagnostic and prescriptive instruction, and the instructional assessment of teachers' needs based upon his teacher training experience. From this information the initial production approach was then developed.

Circulate Tentative Outline to the Field

A most productive activity was the circulation of the proposed course outline to the field. Circulation of the course outline allowed the field persons to identify and adopt the tentative course content and to identify teachers who were eager to participate in the program. The procedure used for circulation of the course outline was to hold open meetings with representative university instructors, public school reading consultants, and classroom teachers at the five main sites.

Revise Course Outline Based Upon Field Suggestions

RRC Unit 1 shows the amount of course modification that resulted from field input. The table reveals that most of the modification occurred in the prescriptive instruction half of the RRC course (program-ity

Table 1

Matrix on Area Where Changes Occur

Program	Area
1 RRC Introduction	RRC Introduction
2 Informal Tests	Informal Tests
3 Standardized Tests	Standardized Tests
4 Oral Reading	Oral Reading/Oral Tests
5 Word Recognition Tests	Phonic Analysis
6 Phonic Analysis Exercises	Phonic Analysis Exercises
7 Phonic Analysis Use of Readers	RRC Readers
8 Oral Language Activities	Readiness and Beginning Reading
9 Comprehension and Vocabulary	Word Recognition
10 Individualized Reading	Vocabulary
11 RRC Readers	Comprehension
12 RRC Games	Oral Reading Process

Additional program content for intermediate grade teachers were also suggested by field reading persons. They were asked the following question to elicit suggestions. "Given the existing K-3 programs, what additional programs would fourth through sixth grade teachers want to implement diagnostic prescriptive reading instruction?" Their suggestions for program topics were: Comprehension-Study Skills Tapes, The Experienced Reader, Study Skills, Reading in the Content Fields, and Developing Life-Long Readers.

Design Research

The original goal of the course development was to develop particular learner profiles and authoring systems as curricula learning techniques. This section gave structure to each process through identifying learning objectives and presentation techniques. This process also gave content validity to program development.

Identify Examples, Field Problems

The first deliverable, produced soon after the Field Trip Plan was approved, the review of the search was completed, and the basic production parameters were decided. The first step was to develop a script outline. Using the script outline, several rough draft scripts were written. The second or third rough draft was sent given to the producer-director. After consultation with the producer-director and subsequent revision, the script was given to a re-entry specialist and another reading specialist. Each of these specialists made additional suggestions for revision, and subsequent revisions followed. A final script was developed using the suggestions of the producer-director, writing specialist, and another reading specialist. Each script was rewritten four or six times before it was produced in the studio. Although several scripts were developed concurrently, it took from three to six weeks from the time the content was specified to the production of the final script in the studio.

Consultant Contacts in the Field

Because of the short time line, writers were consultant to the field for review purposes only. Suggestions given by the field were quite helpful. However, a longer time line would have been needed to utilize these suggestions to script construction.

Field Visits

Three activities needed to be completed before consultants could be made to visits to the field. The activities were:

1. Program goals decided
2. Research review completed
3. Exemplary teachers visited

Consultant to location visits, a critical step in program development, meant that program content was fixed and could assist this point. This was in part because of the time constraints and production requirements. Steps included in location visiting were:

1. Select site survey
2. Select teachers for visiting
3. Plan for use of selected teachers
4. Send letter of intent to site and consult re: dates later
5. Discuss via telephone the desired file by appeal (this usually took four to five telephone conversations)
6. Make transportation arrangements
7. Develop interview questions
8. Consult writer and producer-director plan file sequence with teacher
9. Go visiting
10. Develop video viewing (at site) for content accuracy

Production

Studio production included videotaping the introduction, program content, and a narrative closing segment as well as the recording of narration needed for file segments and the insertion of original file to videotape.

Post Production

As this phase the file open and close, credits and music, file segments, narration, graphics and other were either inserted to produce each particular program.

Develop Outline of Materials

A primary purpose in the development of participant materials was to act as a companion to the video viewing portions activities. The primary aim of the learning plans is also the interactive activity in the learning sequence. It was hypothesized that the more the file activity, they would not perform this activity because. If they were the last activity, they received more participation for the interactive viewing to cause they already knew what they were to do. A set learning and development that consistently involve participants in the program content through having the learners do interactive learning. Participants that given a model of what they were to do through the interactive process. Program content was this introduced with four-channel audio questions. The content was presented three dimensional and learning activities in the narrative role. The last step in the activities was to determine the procedures for a live delivery student.

The sequences of activities for each activity were:

1. Pre-program preparation
2. Interactive program
3. Four-channel audio
4. File activities
5. On-site follow-up activities

It was important to carefully sequence all aspects of the program. Each interactive mode for a video file was given priority in the order. Second, each aspect of activity material construction had to carefully organize them so that there was no activity began when to do. The absence of an activity interrupted the need for carefully developed and well maintained activity materials.

Validate Site Contacts

Each of the model was helpful in testing the learning processes. For the most part, the school personnel were primarily consultants on the visits. The school classroom teachers and audio visual personnel were also used as learning agents. Their activities were thoroughly applied for the selection of learning activities. They were knowledge of learning styles of students and techniques to maximize, and ability to combine and effectively.

The content for the learners contained in activities was in the all file open of the model site-participating unit. Use of teacher questions was an effective learning content technique because the purchased video clips and activity materials varied some activities that could be to be presented.

In summary, that sense of personalized instruction generally experienced in a classroom was included in the actual role of the participant because all the role of learning partners. The classroom visits to student sessions was further reflected in which the teachers interact with each other in part of the activities activities. It was hoped that the initial discussed portions in the activity sequence learning sequence because it was structured in such a way that there was little wasted time.

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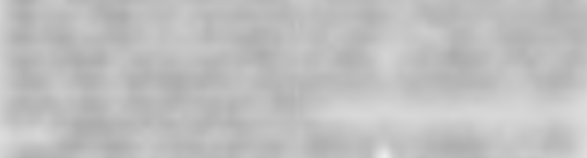

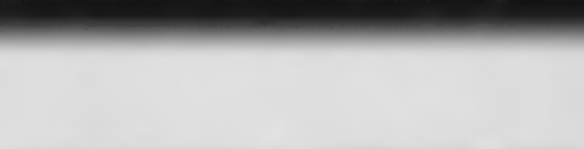

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AN EXPERIMENT IN THE SOCIAL UTILITY OF TWO-WAY URBAN CABLE

Ben Park

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87 East Third Street, New York, N.Y. 10012

(Supported by the National Science Foundation)

Can new two-way uses of cable television help to improve the quality of life of senior citizens? Can two-way cable help service agencies and local government respond more effectively to the real needs and wishes of older people?

These are typical of the many questions which are being asked throughout the United States as people are becoming aware that cable television contains far more technological resources than presently are in use. These questions are a part of the bigger question: Can the many untapped resources of cable television be used in ways which can help to meet the ever-changing requirements and increasing problems faced by city people and those who are responsible for municipal leadership and services?

Reading, Pennsylvania has been chosen as the site of a pioneering experiment which will attempt to find some answers, related to the needs and wishes of the important group of people over sixty.

The experiment will be conducted by groups of senior citizens, and local service agency people and government officials who look to the interests and needs of the elderly. These groups will have access to one of the most interesting unexplored capabilities of the cable: two-way interactive television, which enables people in different parts of the city to both see and hear each other, much as if they were in the same room. Examples of how this might be used are in the case of new regulations in social security benefits, or changes in Medicare or Medicaid, new opportunities for senior citizens to participate in education programs, concerns which older people have about police protection, bus transportation, better ways to get inexpensive, tasty, nutritious food on the table, and many other matters of interest.

Working out of three neighborhood communication centers, knowledgeable people can be invited to share their information, to answer questions and to discuss problems. Because the neighborhood centers are in touch with each other on a two-way channel, they offer the elderly an opportunity to participate in a city-wide network which can - and will - include City Hall, the new New Horizon Center and other points of special interest to the senior population of Reading. It is a way of using the cable to unite elderly people, many of whom would not or could not travel to a single central location. The knowledgeable "experts", furthermore, can deliver new information quickly and effectively to a wide and representative group of the elderly, get their reactions, and discover whatever problems and pitfalls the elderly, themselves, may feel are inherent in the subjects covered.

The possibilities do not stop with exchanges of ideas and information such as suggested in the examples above. The senior citizens at the centers can use the two-way television system for social and recreational events such as holding club meetings, presenting entertainment, sharing a popular speaker, planning and publicizing outings and tours, and giving new programs. When senior citizens have become familiar with the system it is very likely they will develop and go ahead with ideas for using it which are unanticipated by the examples mentioned.

The following basic outline plan has been developed, in concert, by the Alternate Media Center at New York University's School of the Arts, the Graduate School of Public Administration at NYU, representatives of Reading's city government (chiefly Mayor Eugene Shirk and his assistant Jeff Miller), the Berks County Senior Citizens Council (Frank Ruch), the Reading Housing Authority (William Willis), and Berks TV Cable Company (Earl Haydt) after consultation with senior citizens, city council members and city administrators, the involved local service agencies, the local community colleges, many other interested citizens of Reading, and nationally recognized authorities in the field of aging and communication.

It was first decided the focus of the experimental project would be on the needs and wishes of senior citizens because: they are a sizable segment of Reading's population; services for the elderly constitute a significant portion of the work of both private and government agencies; and the elderly as a group share a number of concerns (such as lowered incomes, increasing isolation from friends and families, often decreased mobility, and health problems) which may be alleviated by the capabilities of two-way TV to overcome distance, share information, and enable socialization.

Three Neighborhood Communication Centers will be set up, within Kennedy Towers senior citizens residence, Hensler Garden Apartments for senior citizens, and the New Horizon Center that is being built by the Berks County Senior Citizens Council. Each will be equipped for transmission of two-way TV and for production of program materials by the people using the system. The three centers will be interconnected by a special and private two-way cable. In addition, a group of two hundred senior citizens living at a distance from all three centers will be equipped with cable TV so as to receive, as ordinary television, a private channel which enables them to see the interaction among the three centers; these two hundred will be able to participate in the interactions by telephone.

NYU's Alternate Media Center will supervise the equipping of the three centers and the initial training of people to use the system. (It should be noted that the Alternate Media Center has had a history of close cooperation and productive experience with the Public Access Workshop and CTV-2 of Berks TV Cable. The organizer of the Access Workshop came from the Alternate Media Center to Reading in 1971, and ever since then there have been regular and frequent contacts. A history and description of The Public Access Workshop in Reading can be found in two publications: A STORY ABOUT PEOPLE ('72) available through Berks Cable, and

THE ACCESS WORKBOOK available through the Alternate Media Center at New York University.

Eileen Connell, who has been Coordinator of Implementation and Training of the Alternate Media Center, will begin work in Reading in May, 1975, as System Coordinator. Her first tasks will be to work closely with Berks TV Cable in setting up transmission facilities, to hire and train local people as coordinators of the Neighborhood Communication Centers and as technical production assistants. In the fall, senior citizen volunteers will be recruited and trained by coordinators and staff in all of the functions of the Center, from operation of equipment to management. The first wave of senior volunteers will, in turn, train new volunteers, because it is planned that senior citizens ultimately will take over the running of the centers, with minimal outside assistance. Agency and local government people will be invited to participate at the same time.

In January, 1976, the Neighborhood Communication Centers will commence regular interactive programming. This will continue for fourteen months, with a two-month hiatus in July and August, 1976.

After February, 1977, funded support of the experiment will terminate. However, if the experiment has been successful, all efforts will be made to assure its continuation with support from those sources for whom it has proved effective and efficient, as well as others, such as community colleges. The system and its equipment will be turned over at no cost other than operating tariffs when and if local continuation is organized.

Commencing at the same time as senior citizens are trained in use of the system, self-governing and programming committees will be established; the forms which these will take remains to be determined by the people using the NCC system. Note also, that no name has been given to the system; this and a host of other details of management and policy await the decisions of the system's users.

An Advisory Committee consisting of representatives of the City Government, the Berks County Senior Citizens Council, the Reading Housing Authority, and Berks TV Cable Company will meet regularly with the System Coordinator, the NCC Coordinators, and -- as they are formed -- the self-governing and programming committees of the Centers, to exchange information and explore additional ways in which local agencies, government, and the cable operator can assist the growth of the system.

A team of New York University researchers will evaluate the NCC system's costs and social benefits and will observe the ways in which the experiment develops. These evaluations are designed both to assist the NCC system to operate with optimum effectiveness and to provide essential data for other municipalities which may want to follow the lead of the pioneer experiment in Reading. In addition, federal government bodies, the cable industry, and many other organizations interested in the potential social and economic values of cable television already have indicated their interest in data which they can use at the level of policy and decision-making.

The NYU researchers will conduct their work in a non-interfering and confidential manner. They will be assisted by program monitoring panels of senior aides and NCC staffs. Researchers will establish contact with all of the involved agencies and government offices for the purpose of gaining assistance in measurement of the systems's impacts on services.

There are a host of questions to which we hope to get some answers. For example: How will senior citizens perceive the system? We anticipate that, at the beginning, there will be a strong tendency to carry over models associated with broadcast TV -- to do programs, to see oneself as a panel show member, an interviewer or interviewee, or Queen for a day. Will this perception give way to a model of purposive social interaction? How long will the transition take? What are the barriers -- psychological or physical -- to interaction? Will anyone feel threatened? For example, will social workers see the system as a challenge to their jobs, as a form of unwanted surveillance, as a method that makes them work harder? Or will it open up to them more comfortable ways of working and make them more productive? Will older people use the system, or will the effort of planning and organizing interaction activities seem unnecessary and of little interest?

Naturally, we have canvassed both service agency personnel and older people. Their reactions have been enthusiastically positive, but will we find that the enthusiasm wanes when the novelty has worn off?

Assuming that all goes well and that there is a reasonably high level of use as well as diversity of activities, what then are the measurable benefits which can be matched against the costs of implementing and operating the NCC system?

We plan to have the Reading system in operation on January 1, 1976. We are planning to hold at least one conference to which academics and telecommunications industry representatives will be invited. Those who have particular concerns in what we propose are welcome to visit the experiment, and to declare your interest in attending a conference.

In addition we will be submitting interim and final reports, copies of which will be made widely available.

THE ROCKFORD, ILLINOIS CABLE PROJECT: THE MICHIGAN STATE UNIVERSITY APPROACH TO DEVELOPING PROPOSALS FOR EXPERIMENTAL APPLICATIONS OF TWO-WAY CABLE COMMUNICATIONS IN URBAN ADMINISTRATION AND SOCIAL SERVICE DELIVERY

Presented By

Thomas A. Muth
College of Communication Arts and Science
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East Lansing, Michigan

The Research Team

Thomas Baldwin and Bradley Greenberg have conducted major research on Social Service Delivery Via Cable Television and their work was among the most current research on cable communication potentials in the Spring of 1974.[1] This and prior research by Baldwin and Greenberg had resulted in the establishment of a rather large, interdisciplined research team centered in the College of Communication Arts and Science at Michigan State University. Expertise was drawn from diverse fields such as telecommunication, human communication, electrical engineering, systems and computer science and law. Thus when the National Science Foundation Research Applied to National Needs division announced a program to fund research on two-way applications of cable for social service delivery and urban administration, we could quickly identify the research issues involved and outline a program to develop a comprehensive proposal.

Approach to the Problem

Although we had a standing research team, we had neither a ready site for the research nor specific cable technology most apropos for the issues we wished to consider. This essentially required the selection of a city with an advanced cable television system. The system had to have either existing two-way capability, or potential two-way service that could be readily activated.

Selection of Cable Plant and Technology

Three major considerations arose in identifying the best cable plant for the experiments.

(1) The two-way service had to be operational or nearly operational. We could use a dual cable system or a single cable system that merely required installation of return amplifiers to activate the two-way service.

(2) Engineering cost was a prime early consideration. The cable plant had to be well designed and regularly providing a stable signal. Since two-way cable does not regularly operate in many communities, there has been little experience with technical considerations, thus we sought a system that would provide a good signal and service that would not deteriorate with the introduction of return signal components.

(3) The third consideration was technical amenities of the cable system. This was closely related to the level of cooperation we required from the cable system management. We reasoned that a system without fairly complete production and headend facilities would require excessive investment in non-research related hardware and the management would not be as progressive as required for the cooperation levels needed in the research.

These essential elements needed to establish the project proposal were identified in the early relationships that developed with the cable system, Cablevision Rockford. It is locally owned. It's management, technologists and staff demonstrated considerable interest in the project and proficiency in cable and broadband communications. The presence of this cable system and its highly cooperative attitude weighed heavily in our determination to proceed with the proposed research designs in the Rockford area.

Selection of a Community

The selection of a community was considered simultaneously with the selection of a plant. The community has to be extremely cooperative and willing to devote healthy amounts of official and staff time to the proposals, experimental designs and the projects. To secure the level of cooperation NSF sought from the community it was suggested that official declarations of support were necessary. We examined a number of communities in and surrounding the Michigan area and subsequently were contacted by the councilmen and the mayor from the City of Rockford, Illinois. They expressed the strongest interest in developing a project that we had encountered. We visited Rockford several times and gradually reached mutual agreement that it seemed to be an ideal community for the project, and our research team seemed ideal for the community. A large number of community leaders were systematically interviewed to initially assess the potential communication needs of the community. The city government expressed its level of full cooperation by adopting resolutions to cooperate and support the MSU research team and to put the resources of the city at our disposal. Key city and county staff personnel ultimately became associated on the research project staff as a result of this cooperation.

Selection of Two-Way Hardware

Selecting two-way equipment presumed that the experiments proposed were sufficiently developed to identify the two-way communications to be examined. We selected a variety of experiments that would test telecommunication teleconferencing applications, downstream video-upstream digital signals, and hybrid audio/video digital communications.

The teleconferencing applications did not pose significant hardware problems. Most of the equipment required for teleconferencing is readily available from suppliers. Applications involving upstream digital transmission from multiple terminal locations presented a greater challenge. Few suppliers offer

systems and terminals specifically suited for coaxial cable applications. The low production volume of the equipment and systems available tends toward more expense than could be budgeted for hardware within the NSF guidelines. NSF was requesting applications to evaluate the social service and administrative potentials of cable communication systems. Accordingly hardware budgets were limited rather strictly. After considerable exploration of a number of interactive terminal systems we ultimately selected a low cost approach offered by a young firm, Coaxial Scientific of Florida. (Details of the Coaxial Scientific System follow the descriptions of our applications.) The Coaxial Scientific system is designed for pay cable, and terminals had to be modified for our applications. The use of a system designed for pay cable allowed us to propose experiments that could examine cost sharing between public and private sector cable uses.

Details of the Experimental Applications Designed

The two-way applications proposed by Michigan State University, the City of Rockford, Illinois, and CATV of Rockford include the following:

Firefighter Training

A firefighter training program in prefire planning was developed through a formative evaluation process which includes the use of station house response terminals for instant return communication to the Training Academy. Once developed, the prepackaged lessons will be delivered to the stations in two instructional formats. For one, a linear programming type format with systematic response and reinforcement will be scheduled for mastery level training of individuals and groups. For a second instructional format, simulation games will be played among station houses, in which the fire crews compete in their attempts to arrive at the most competent solutions to prefire planning problems and suppression strategies based on prefire plans. The major evaluation variables include average training hours per man to mastery, cost per training hour, quality of prefire plans submitted after training and training program administration efficiency. This experiment was subsequently funded by NSF and is currently in early stages of implementation at Rockford.

Science Education Teleconferencing

In the test community, special interest centers have been created to make educational opportunities available to all students that individual schools cannot provide. One, the Math-Science Center, intakes each week a racially mixed collection of classes. This application proposes to supplement the single week of academic and intercultural experience through a teleconference linkage among the visiting schools. The schools would meet in teleconferences prior to their week in the special interest center for purposes of orientation and work assignments. Parents and teachers from the designated schools would meet in a parallel teleconferencing fashion. Most critical, the week at the Center would be followed up by a 6-8 week period of in-school teleconferences in which the students continue to associate, both for work tasks and for social acculturation purposes.

Developmental Delays

Children will undergo developmental screening tests, during a Phase 1, administered by their parents in their homes, in response to informational directions provided by a professional examiner over a two-way, interactive television system. Parents will report their child's proficiencies and deficiencies. Throughout the process, the television examiner will be asking for feedback on pacing and any child-parent anxieties which can be anticipated. Groups of 15-20 children can be tested simultaneously with this sytem. Phase 2 involves attempts to intervene among those children who have been identified in the first phase as having more or less severe learning problems or problem potential. This intervention will be home-based, via interactive telecommunication, to supplement whatever clinic-based remedial work the child is undergoing simultaneously.

Cable Information and Referral Service

Television vignettes will be produced for a sub-set community social services. These vignettes will provide information with which homes in the telecommunication system can self-identify their needs for a particular social service. Using a special "human services" television channel, the home can immediately identify itself as either desiring additional information, or in actual need of the social service. The home's response will be immediately reacted to by the information and referral service with either additional information, direct referral to the appropriate agency, or by seeking additional intake information from the home. This application has also been designed to provide information for aged persons.

Legal Communication

This application has two principal thrusts. For one, it proposes to use telecommunication systems for the taking of depositions from depositions from witnesses. Two attorneys, a court reporter, and the witness, at different locations, will engage in the normal legal transaction of deposition-taking, without the burden of requiring that all be physically present. The second focus is the utilization of telecommunication systems to efficiently store, distribute and retrieve legal information, e.g., relevant cases, to schedule the calendar of work of the courts, and to disseminate current, local, legal news information.

Technological Considerations

The Coaxial Scientific Corporation has developed the basic design for the return system. The CSC system divides the cable system into modules of 100-200 homes. A mini-computer located at the cable headend serves to switch on one set of homes at a time, scanning the entire system in a few seconds and obtaining from each set on the system a data word of 16 bits, including information on whether the set is one, whether a special pay TV key or response mode switch on the converter has been selected, and which button is depressed. The cable system has been equipped to the computer's uniquely addressed signals to open the system at the specified points at the proper time. This switching does not affect the downstream flow of video, but only the lower portion of the transmission spectrum devoted to upstream data

flow. The mini-computer at the headend interrogates the system.

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The Pacific vast and enclosed as it stretches across 64 million square miles. For some, these words bring to mind diverse cultures, vast traditions, exotic lifestyles, and intriguing customs. For others, however, the Pacific represents challenge. Geographic isolation and inadequate communications constitute the principal barriers to social development for island nations. The project I am going to describe is an attempt to reduce these barriers through international cooperation and sharing using satellite communications.

A series of satellite communications applications will reveal that the benefits of developments in space communications have not been readily available to peoples in all areas of the world. The development of telecommunications services and services needs to have followed industrialization with its demand for communications. In very broad outlines, it appears that a developing country must first experience the transforming effects of industrial development, usually emergent and capitalized from outside the country, in order to enjoy the telecommunications development which is essential to educational and social development, capitalized from inside the country. The use of telecommunications services for the realization of social objectives through international communications exchange finds great industrial countries in a position of advantage over agrarian countries.

- The high cost of telecommunications technology discourages use by less industrial nations.
- Telecommunications service planning and operation are geared to serve the industrially advanced nations which are already better equipped to meet social requirements.
- The societies which develop the technology for communications also tend to control its application.
- The prepared media materials used in the large telecommunications systems are almost totally the product of the industrially powerful and reflect and advocate their attitudes and behavior.
- Legal issues--such as those addressed to copyright law and spectrum management--considerable and perpetuatory message content to the industrially powerful.

While, for the most part, the industrialized nations seem to be gaining the greatest access and use of the more recent developments in telecommunications, international and transnational communications should be increasing as the eyes and ears of leaders in developing countries are sharply focused and carefully tuned to these new applications.

The small nations and territories of the Pacific Basin, ranging in area from 9 square miles on the island of Nauru to 11,000 square miles of the Solomon Island chain, with populations ranging from 35,000 in Kwajalein of the Cook Islands to 400,000 of urban Honolulu, Hawaii, all find telecommunications services to be a prime factor in development. Low income areas find services and prices too costly for rapid and efficient integration into a social system. The islands of the Pacific are, for the most part, poor, with the economy dependent on agriculture, fishing, minor industry, and some mining. For example, less than 15,000 people inhabit the 12 islands of the Cook chain. These people are not merely at the subsistence level; here one encounters not the hungry stomach, but the hungry mind and spirit. Most of the people are employed primarily in work, and most import all meat and milk products. Many Cook Islanders have a livelihood in agriculture. In 1970 Lebanese on the six airports were earning up to $40 a week with overtime.[1]

Health and education needs are a priority in every national development plan in most countries. Communication and the sharing of expertise is greatly needed. The National Indonesia Cable is available to most regional centers and INTELSAT communications is available to New Zealand, Fiji, Guam, and Australia. Conference calls linking all major centers together already are and currently practical or possible, however. Most Pacific territories are served by radiophone, though the reliability and use flexibility are severely limited. All island communications provide a variety of communications resources to the Pacific, for example, but the prices are prohibitive to developing nation peoples. A three minute radiophone call from Madang in Papua New Guinea to Australia costs $3.00. The price climbs for a U.S. interconnection. When one considers that the average salary for a school teacher in the Kingdom of Tonga is $11.25 a month, it is understandable that most island peoples are priced out of the telecommunication services provided by the private sector. Private businesses are not motivated to service these low traffic areas--the investment is too great.

Additionally, many developing islands take a cautious approach to technological advancement, including telecommunications development. They have observed the abuses and excesses of western industrialization and do not want to risk erosion of their native cultures and value systems. The most recent edition of the Pacific Islands Yearbook reported on the new jet airport which was soon to be opened in Nukualofa, the principal island of the Tonga group. Attention was called to the effects of rapid transportation on the local environment. "Tourists came to tourist resorts; tourist trade will be ignored; tourists bring cultural influences and do not want to visit areas

1. It is impossible to ask a question.
2. The lecture is going too slowly.
3. The lecture is boring.
4. The lecture is very interesting.
5. The lecture is going too quickly.
6. The lecture is too complicated.
7. I did not hear the professor.
8. I did not hear the other student.
9. I do not understand the professor.
10. I do not understand the other student.

A recent experiment conducted in the Educational Communications Project by Shirley Morrison, a fourth year social psychology student, replicated an early finding by Thibaut, Coules and Robinson (1955). It created an experimental situation in which subjects viewed a two part lecture via closed-circuit television (in actual fact, the lecture was video-taped). The lecture was deliberately ambiguous, contradictory and awkwardly communicated. Following the first part of the lecture, students gave feedback to the lecturer in the form of a questionnaire. In a Compliance condition, the lecturer preceded the second part of the lecture saying he had read the students' comments and he would try, as they suggested, to slow down and deliver the lecture more clearly. In a Non-Compliance condition, he told the class that he read their comments but did not feel that he could depart from his established teaching style and would continue the lecture as he had up until this point. In the Control condition, the feedback was not given to the lecturer and he continued with part two. This second part of the lecture, of course, was also on videotape and was the same in all three conditions. The results were similar to the earlier findings of Thibaut, Coules and Robinson (1955). Figure 15 shows that the Compliance condition had less rejection and greater acceptance of the lecturer and the cablevision medium of communication than did the Non-Compliance and Control conditions. The students had more favourable impressions of the person and the technological delivery system when they believed that their feedback exerted an influence upon the conduct of the lecture.

6. It is most likely that a media lecturing style will evolve in teleteaching projects. This style might depart from the traditional standup lecture and use the special communications characteristics to advantage rather than trying to substitute for a face-to-face teaching situation. If, as mentioned above, teleteaching experiments communicate directly to the remote student audience, the lecturer may find it more comfortable to sit down to address his class. This had the advantage of creating a more stable audio pick-up condition at the teacher-end of the system and it also makes a media control console more feasible, putting all switches and adjustments within easy reach of the lecturer. Likely it will turn out that some faculty members who use such systems will readily evolve this media teaching style while others will not, just as some teachers communicate best in large lecturehall situations and others excell in small seminars.

5. Results of the test which measured lecture material comprehension of the students in the three conditions (traditional, present, and remote classes) revealed no significant differences in learning (Figure 16). This would suggest that this teleteaching situation may not have disturbed the understanding of the material by the students. Certainly, student attitude towards these systems will interact with their ability to learn using them. Perhaps the best index of student acceptance of a teleteaching experiment would be found in the number of students who voluntarily enroll in courses taught in this way when other options are open to them.

At this point, it is difficult to predict what role modern communications technology will play in the future of education. It is not difficult to advance "armchair hypotheses" that gaze into the future; yet this can lead us to as many theories as theorists. The important questions of future acceptance, user impacts and educational consequences will require empirical testing. This means more trial projects and experiments, both "real word" and laboratory simulations. If we are to shape the wise application of educational technology, we must attain that wisdom through our experience.

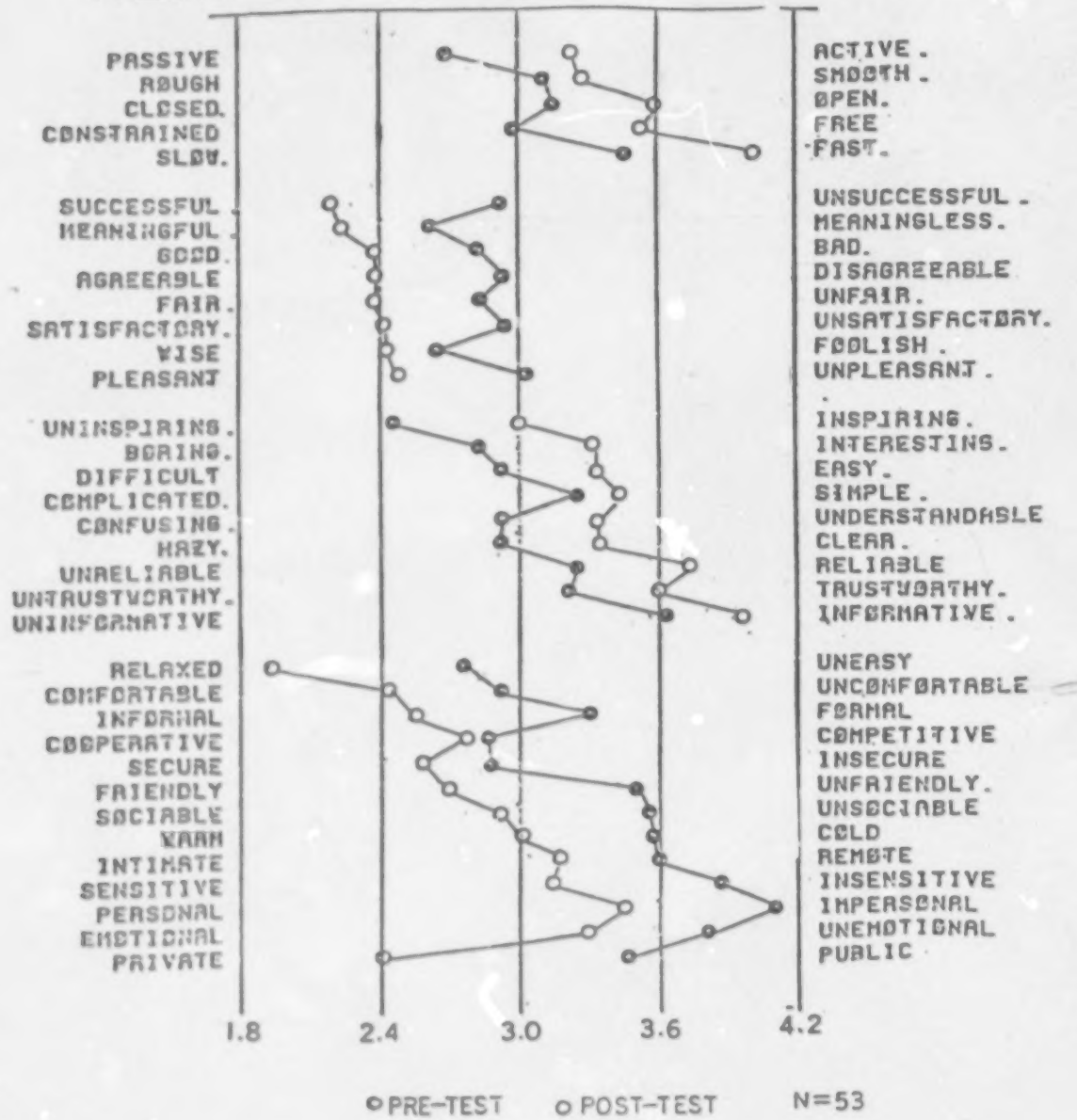
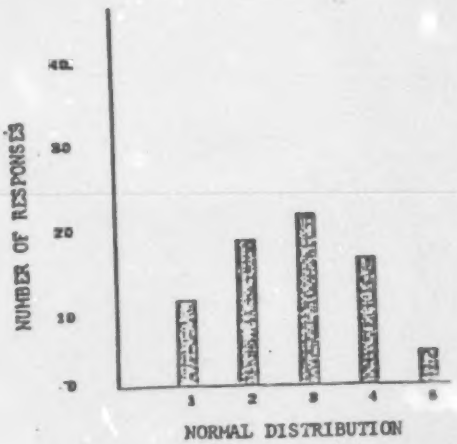

MEAN ATTITUDE RESPONSE
PASSIVE
ROUGH
CLOSED.
CONSTRAINED
SLOW.
SUCCESSFUL.
MEANINGFUL.
GOOD.
AGREEABLE
FAIR.
SATISFACTORY.
WISE
PLEASANT
UNINSPIRING.
BORING.
DIFFICULT
COMPLICATED.
CONFUSING.
HAZY.
UNRELIABLE
UNTRUSTWORTHY.
UNINFORMATIVE
RELAXED
COMFORTABLE
INFORMAL
COOPERATIVE
SECURE
FRIENDLY
SOCIABLE
WARM
INTIMATE
SENSITIVE
PERSONAL
EMOTIONAL
PRIVATE
ACTIVE.
SMOOTH.
OPEN.
FREE
FAST.
UNSUCCESSFUL.
MEANINGLESS.
BAD.
DISAGREEABLE
UNFAIR.
UNSATISFACTORY.
FOOLISH.
UNPLEASANT.
INSPIRING.
INTERESTING.
EASY.
SIMPLE.
UNDERSTANDABLE
CLEAR.
RELIABLE
TRUSTWORTHY.
INFORMATIVE.
UNEASY
UNCOMFORTABLE
FORMAL
COMPETITIVE
INSECURE
UNFRIENDLY.
UNSOCIABLE
COLD
REMOTE
INSENSITIVE
IMPERSONAL
UNEMOTIONAL
PUBLIC
1.8
2.4
3.0
3.6
4.2
PRE-TEST
POST-TEST
N=53

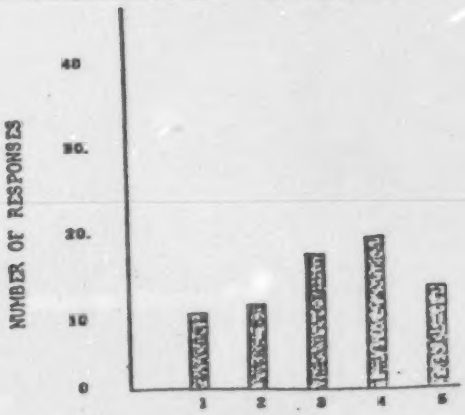
Figure 3

Frequency of student response to item: Meeting Individual Needs of Students (where 1= not at all; 5=a great deal)

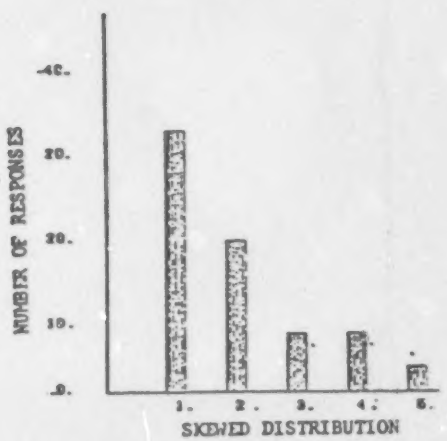


NORMAL DISTRIBUTION

Frequency of student response to item: Do you feel that more research should be conducted before introducing this form of Instructional Technology for widespread use in the university? (where 1=not at all; 5=a great deal)

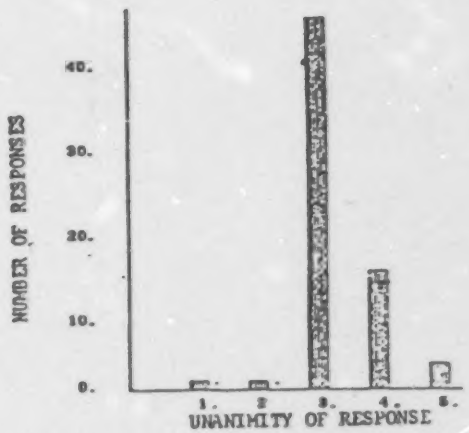


LACK OF CONCENSUS OF RESPONSE



SKEWED DISTRIBUTION

Frequency of student response to item: Diminishing the Importance of the Instructor (where 1=not at all; 5=a great deal)



UNANIMITY OF RESPONSE

Frequency of student response to item: Television primarily assists the student to learn (1 on the scale) or the instructor to teach (5 on the scale; 3 equals both equally)

Figure 2

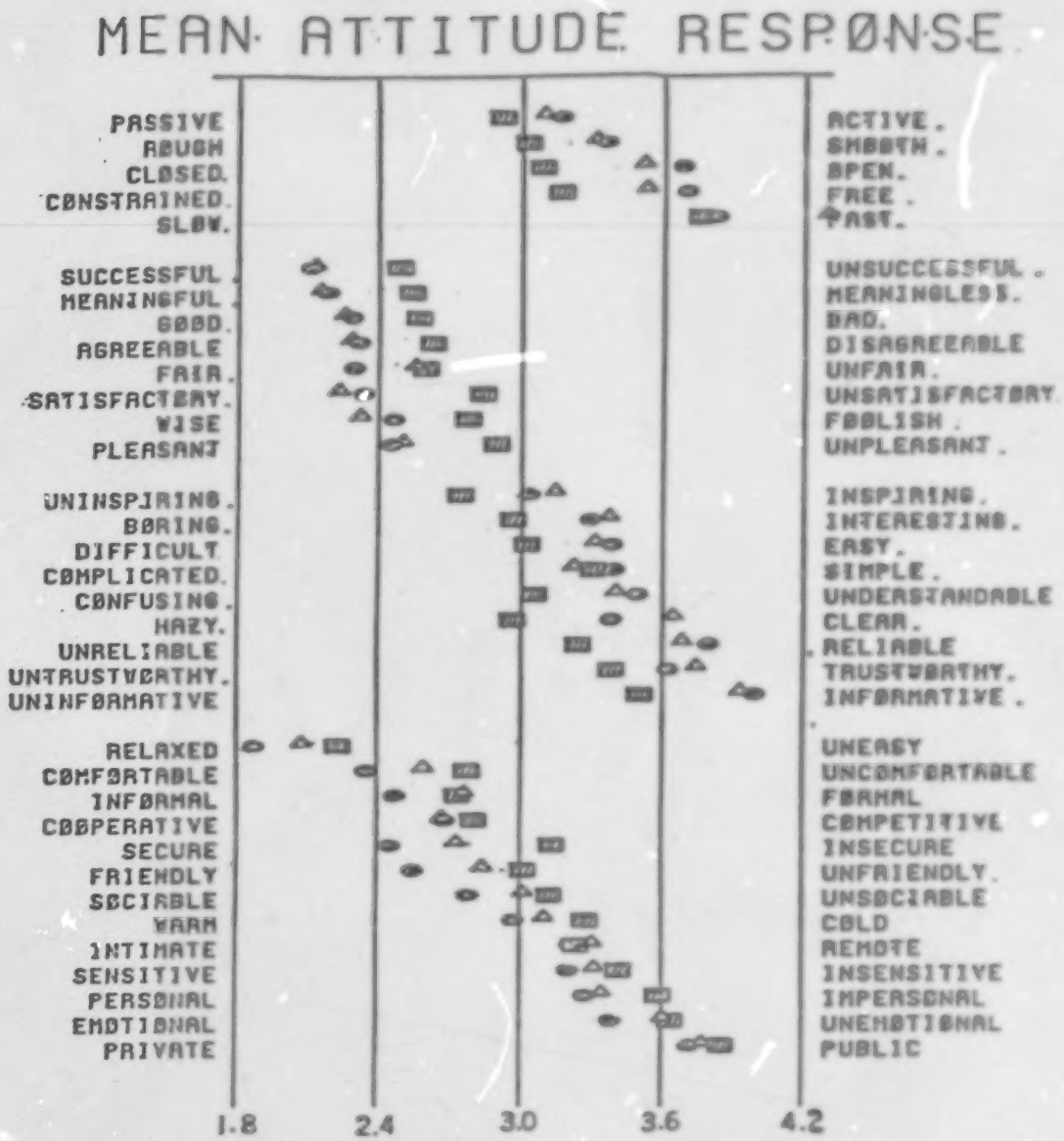

MEAN ATTITUDE RESPONSE
PASSIVE
ROUGH
CLOSED.
CONSTRAINED.
SLOW.
SUCCESSFUL.
MEANINGFUL.
GOOD.
AGREEABLE
FAIR.
SATISFACTORY.
WISE
PLEASANT
UNINSPIRING.
BORING.
DIFFICULT
COMPLICATED.
CONFUSING.
HAZY.
UNRELIABLE
UNTRUSTWORTHY.
UNINFORMATIVE
RELAXED
COMFORTABLE
INFORMAL
COOPERATIVE
SECURE
FRIENDLY
SOCIABLE
WARM
INTIMATE
SENSITIVE
PERSONAL
EMOTIONAL
PRIVATE
ACTIVE.
SMOOTH.
OPEN.
FREE.
FAST.
UNSUCCESSFUL.
MEANINGLESS.
BAD.
DISAGREEABLE
UNFAIR.
UNSATISFACTORY
FOOLISH.
UNPLEASANT.
INSPIRING.
INTERESTING.
EASY.
SIMPLE.
UNDERSTANDABLE
CLEAR.
RELIABLE
TRUSTWORTHY.
INFORMATIVE.
UNEASY
UNCOMFORTABLE
FORMAL
COMPETITIVE
INSECURE
UNFRIENDLY.
UNSOCIABLE
COLD
REMOTE
INSENSITIVE
IMPERSONAL
UNEMOTIONAL
PUBLIC
1.8
2.4
3.0
3.6
4.2

Figure 1

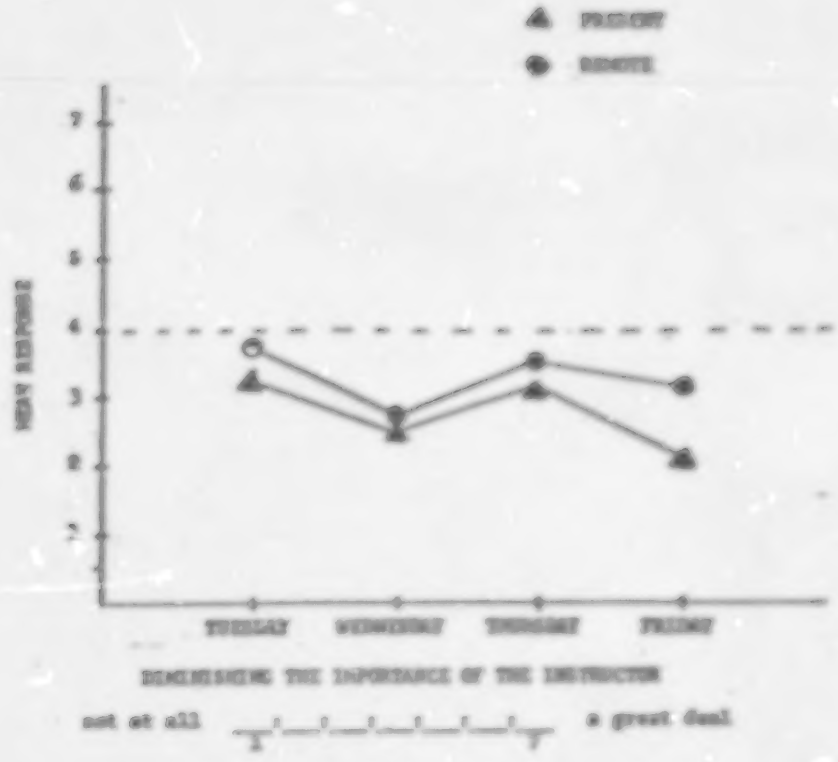

DIMINISHING THE IMPORTANCE OF THE INSTRUCTOR
not at all
a great deal

Figure 4

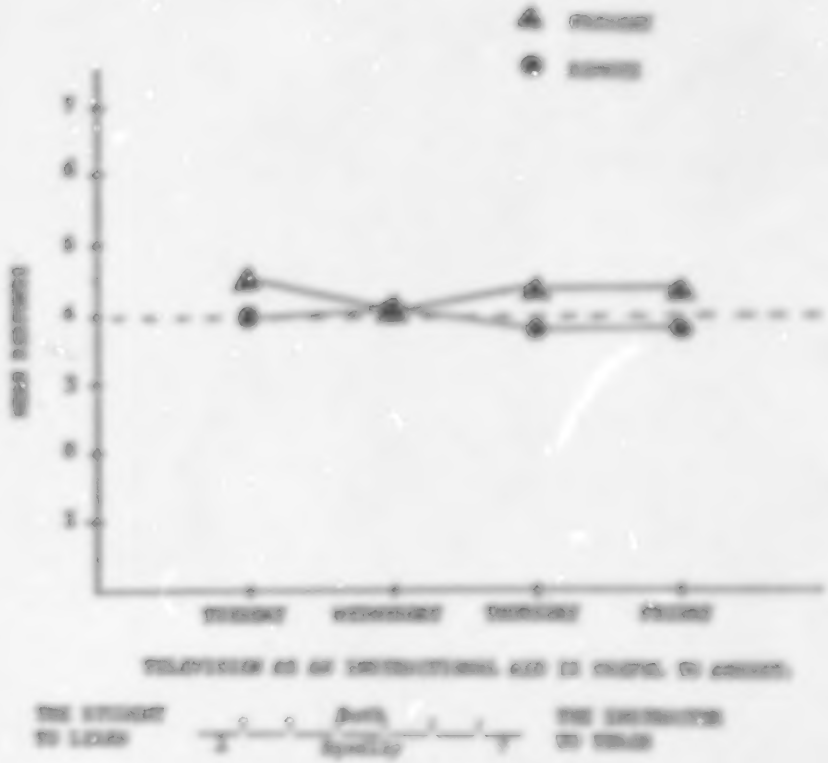


Figure 1

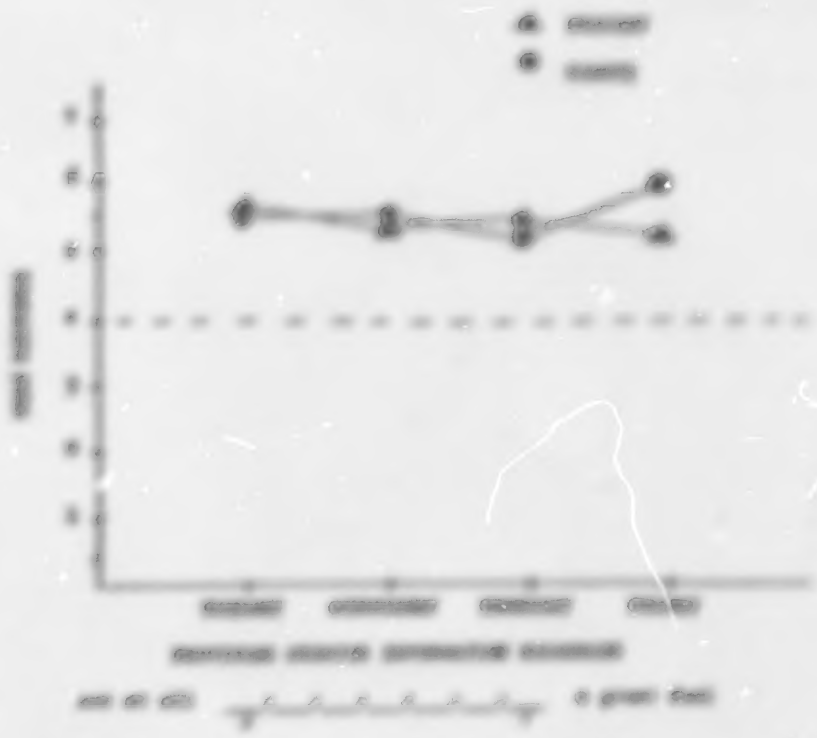


Figure 4

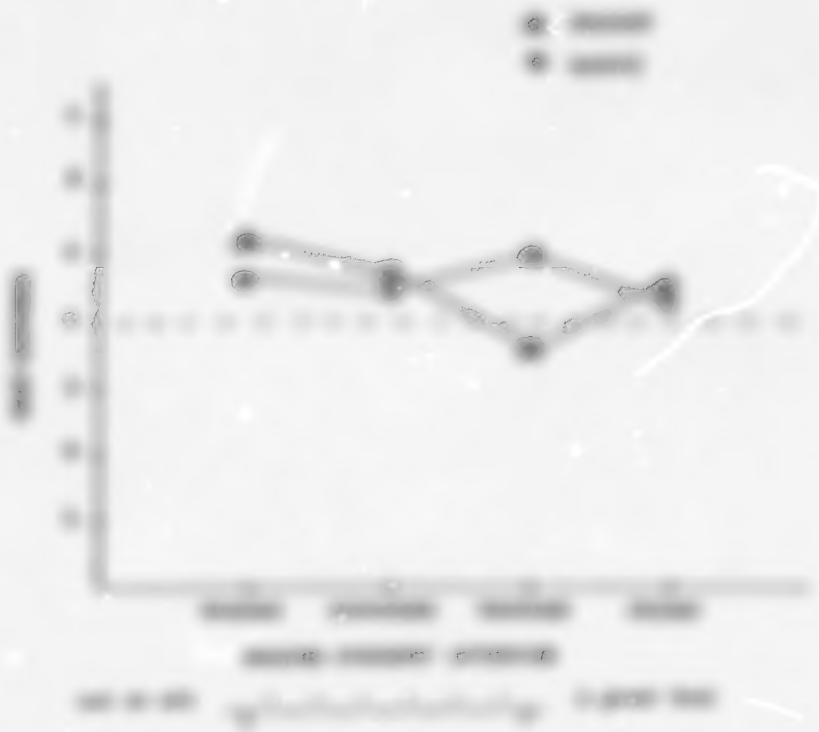


Figure 1

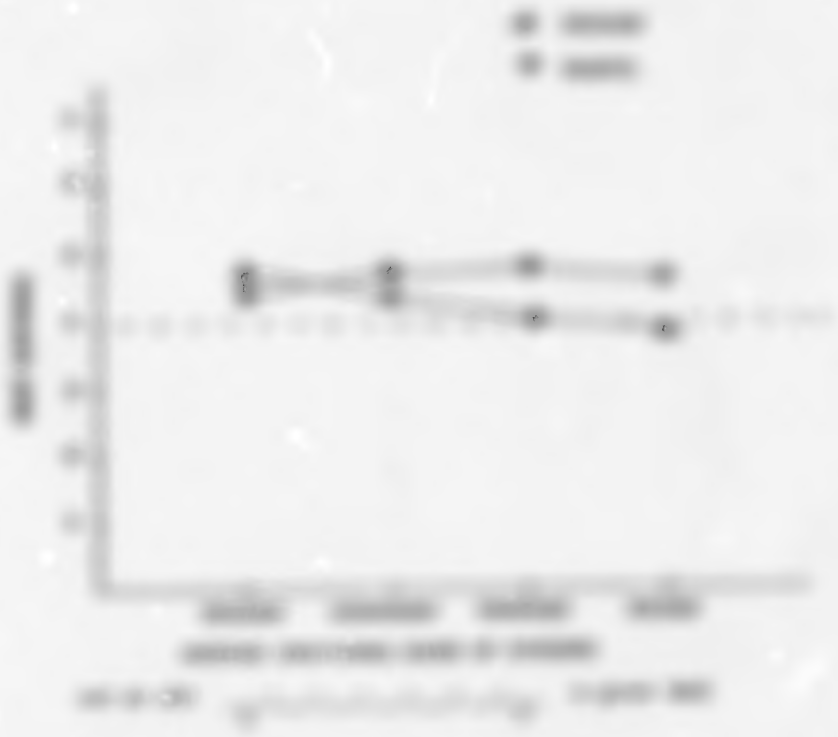


Figure 3

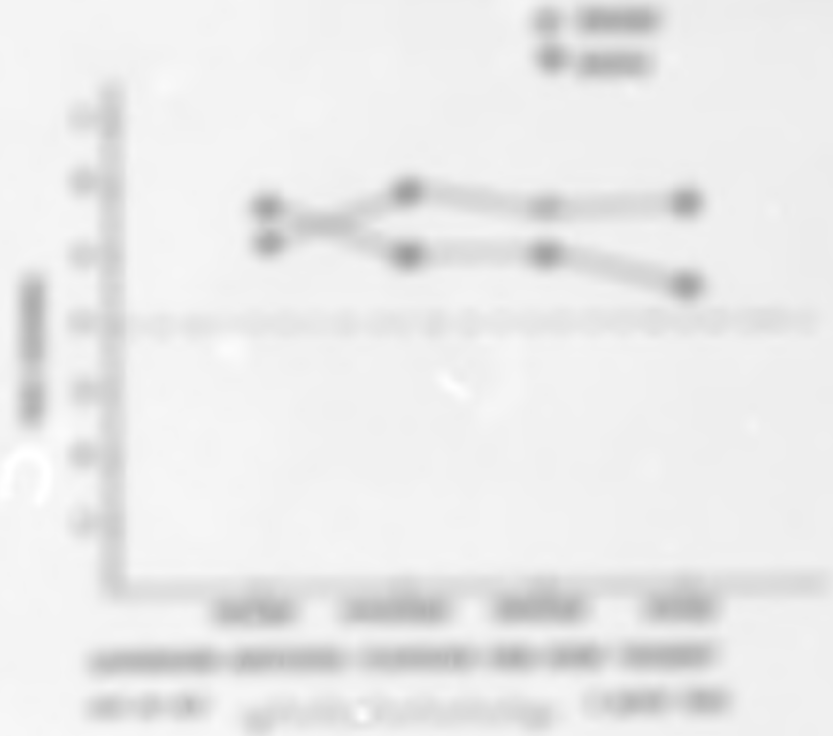


Figure 1

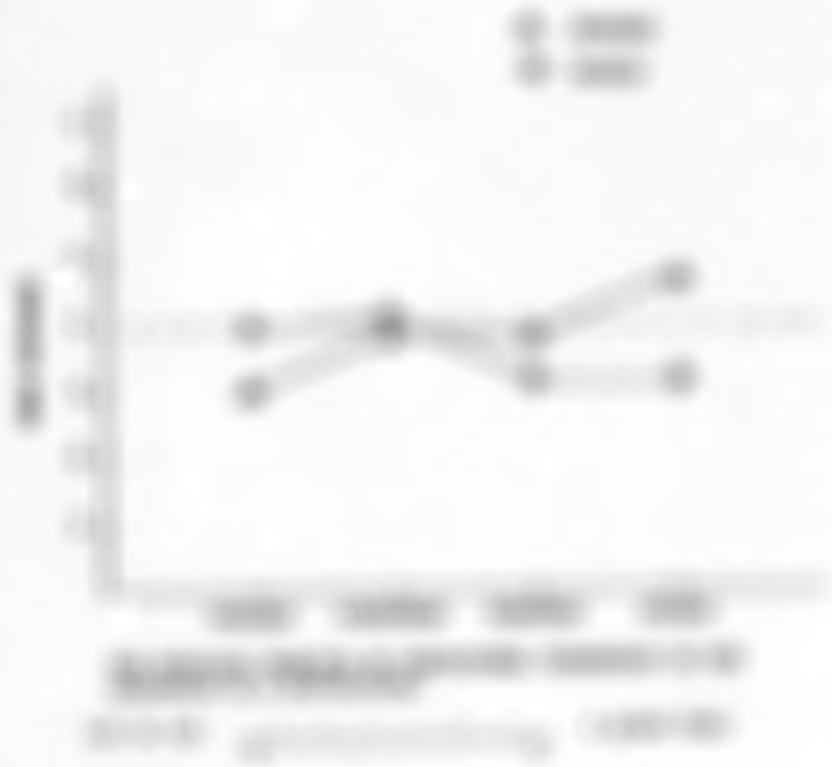


Figure 1

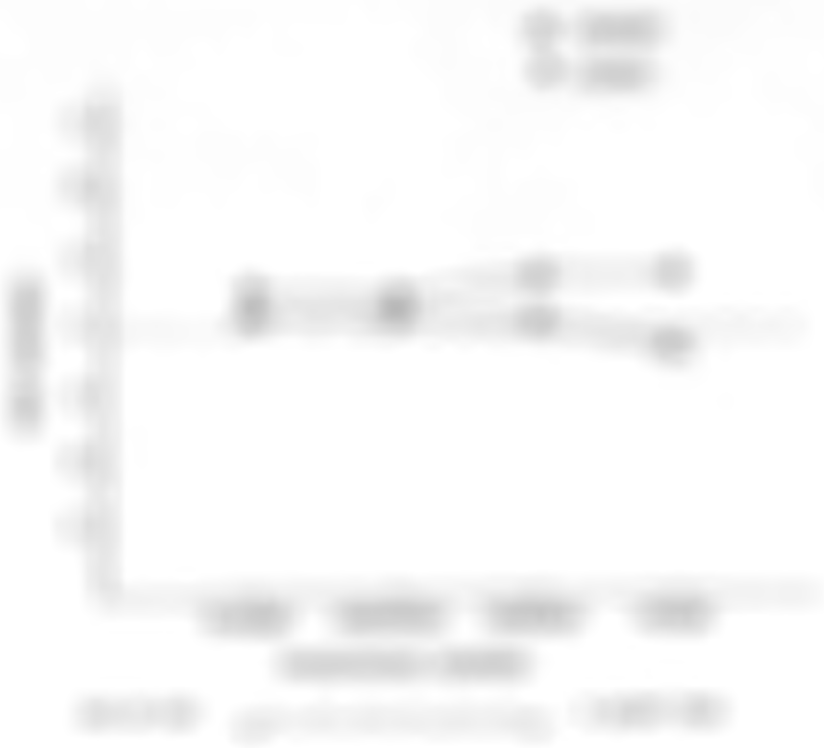
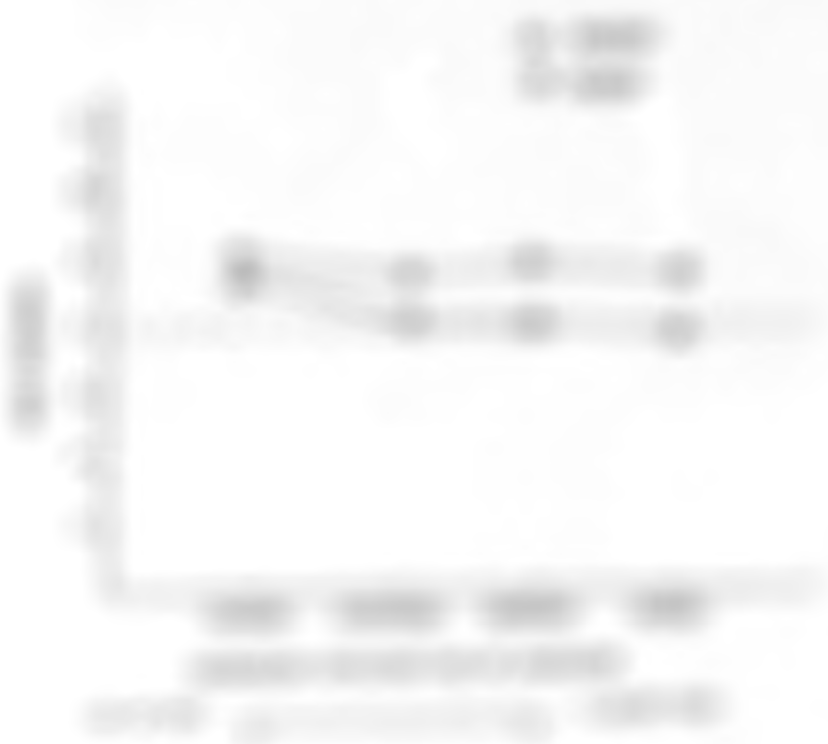
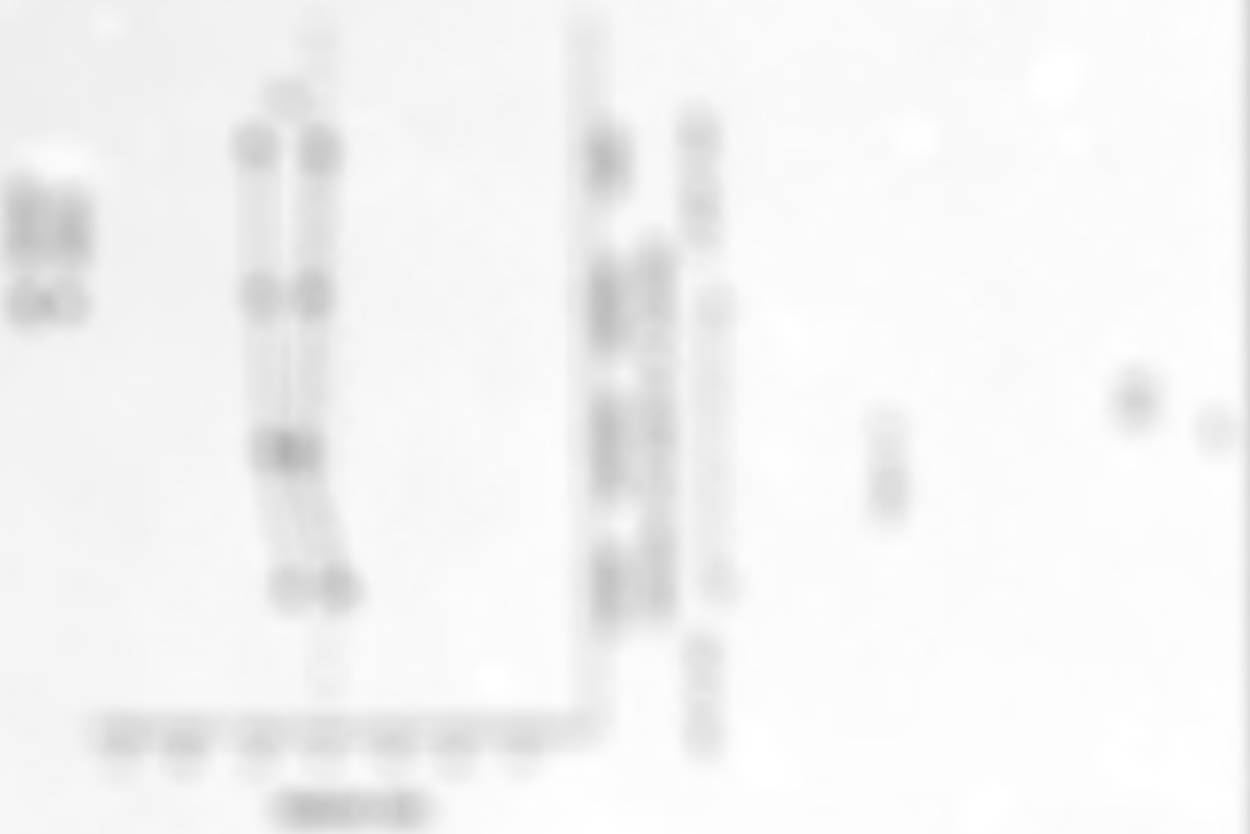


Fig.1





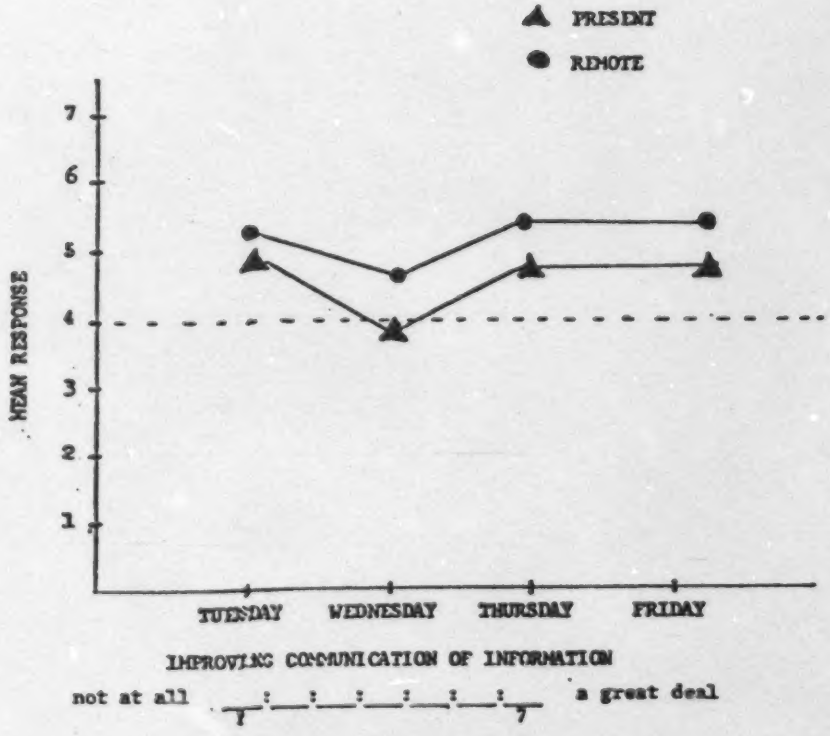

PRESENT
REMOTE
MEAN RESPONSE
7
6
5
4
3
2
1
TUESDAY
WEDNESDAY
THURSDAY
FRIDAY
IMPROVING COMMUNICATION OF INFORMATION
not at all
a great deal

Figure 14

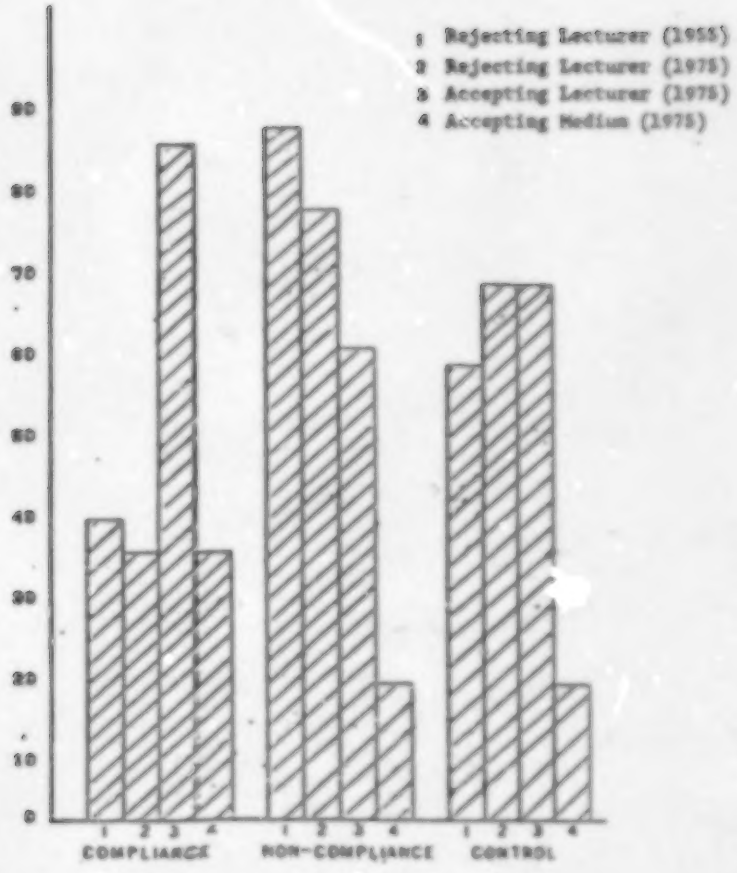

1 Rejecting Lecturer (1955)
2 Rejecting Lecturer (1975)
3 Accepting Lecturer (1975)
4 Accepting Medium (1975)
90
80
70
60
50
40
30
20
10
0
1 2 3 4
COMPLIANCE
1 2 3 4
NON-COMPLIANCE
1 2 3 4
CONTROL

Figure 15

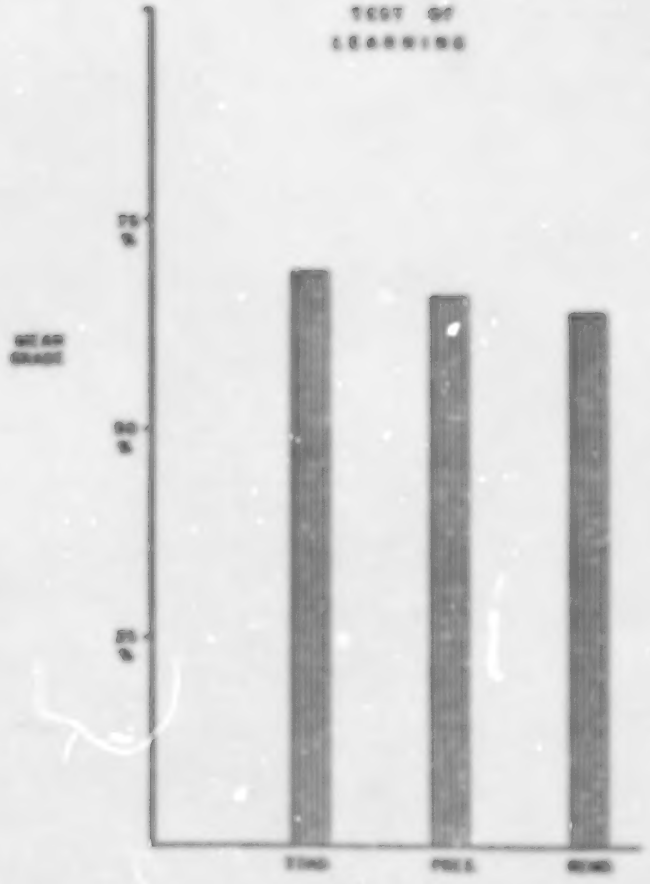


Figure 16

[illegible]
A PROJECT OF THE BILINGUAL CENTRE
[illegible]

presented by

[illegible]

[illegible] was to build on [illegible] concepts of CTS experiment broadly designated as socio-cultural. It is an attempt to use modern technology, and more particularly, the Communications Technology Practice to confront a situation resulting from historical, political, linguistic and sociological conditions. As the name implies, [illegible] involves the linking of two provinces in Canada, Saskatchewan and Quebec, and to be more precise, two small communities, Saint-Paul, Saskatchewan and Baie St. Paul, Quebec. Within the CTS project it is the only experiment involving long-distance East-West communication.

The two communities involved are 2,000 miles [illegible] apart. [illegible] are situated in areas which are geographically [illegible] each other. Baie St. Paul, in Quebec, is situated on the north shore of the St. Lawrence River about sixty miles east of Quebec City. The anchorage at the mouth of the Rivière du Gouffre with the mountains in the background and the sheltering Ile aux Coudres off-shore, attracted sailing enthusiasts and it was settled in 1678. Saint Paul, on the other hand, is to be found in the middle of the continent at the point, some 500 miles south of the Canadian-U.S. border, where prairie merges into parkland. It was settled in the early years of this century by pioneers who had come originally from Quebec, many having spent some time in the northern American states on their way. Both settlements are relatively small - Saint Paul, the smaller, has some 800 inhabitants, both are isolated and, most important for the purposes of [illegible], both are French-speaking.

It may be useful at this point to recall the Canadian context into which [illegible] fits. Canada is officially bilingual, and the province of Quebec has been preponderantly French speaking. The much-debated Bill 22 will give French the status of sole official language in the Province. Non-Canadians are likely to be less aware that there are French-speaking settlements in many other parts of Canada as well. Best known might be Acadia, in the East and St. Boniface, one part of Metro Winnipeg in the Middle West. In the prairie areas, French settlements, normally small villages like Saint Paul have existed from the turn of the century when the West began to be opened up. During the years since their foundation, these French communities have tried to preserve their French language in culture and, traditionally linked to Quebec, the latter provides, for support. The tendency today is for the people of Quebec to see these French communities outside the province as a lost cause, doomed to extinction because of their location in a mainly English-speaking setting.

With this knowledge in mind we may see there there is an important difference in the decisions of Saint Paul and Baie St. Paul. The latter has, up to very recent times, been isolated geographically: the former is isolated not only geographically but also linguistically and culturally. It is an island of French-speakers, or Francophones surrounded by a vast sea of English-speakers, most of whom have little enough sympathy for things French. It is struggling to hold its own as a town when the drift away from rural areas is strong and it is fighting to keep its identity when other French settlements in the West have already gone under.

In an officially bilingual country, the bilingual system of the University of Regina promotes bilingualism in the University and also reaches out into the community. In practical terms this means encouraging French-Canadians to maintain and strengthen their cultural and linguistic heritage and at the same time seeking to remove some of the prejudices existing in the minds of those opposed to "la fait Francais." It provides English language courses for students from Quebec, urges Saskatchewan students to study in Quebec and facilitates as many exchanges as possible between the two linguistic groups.

It is natural that the Bilingual Centre should be interested in any attempt to maintain French in the province, and when we learned of the existence of the CTS project, possibilities immediately suggested themselves to us. Our project, as first conceived, aimed at putting a Francophone community in Saskatchewan in communication with a similar community in Quebec. This involved the choice of a community, which proved no easy task. However, when we came to look at Saint Paul, a decision was quickly made, for here was a traditional little prairie town, but one which was remarkable for the determination of its inhabitants to maintain their community in the face of great difficulties. This had encouraged them to form cooperatives, to set up a small clothing factory and an ultra-modern printing plant. Agriculture in the surrounding area is thriving and diversified, cash crops, flax and honey being produced as well as wheat. As well, the citizens had recently acquired a former convent to use as a cultural centre. We were enthusiastically received by the people of Saint Paul and their expressed interest in our project. After discussion, they agreed to take part and elected a citizens' committee.

We have stressed from the outset that, in this exchange, the impetus must come from the communities involved: we were, so to speak, auditors. Logically, the people of Saint Paul played a part in the choice of the community with which they would communicate. We have previously established relations with the Government of Quebec, which had other CTS projects, and they suggested Baie St. Paul. Representatives of Saint Paul were there and agreed that it was a suitable location. Thus the choice was [illegible] and [illegible] came into being.

As far as the practical is concerned, [illegible] will take place in 1977. In the fall of that year a 3-hours [illegible] will be located in each community, permitting two-way audio and video communication over

[illegible]

[redacted]

TABLE II (Continued)

COST COMPARISON

Educational Satellite Distribution System

Satellite Transponder Rental	$ 1,500,000	
Number of Schools Participating	50	
Annual Cost per School (Space Segment)		$ 30,000
Earth Station (receive only)	$ 75,000	
Useful Life	10 years	
Average Cost of Capital	7%	
Annualized Earth Station Cost		$ 11,000
Annual Earth Station Maintenance Expense		5,000
Two-Way Earth Station	$ 275,000	
Less TVRO	$ 75,000	
	$ 200,000	
One Uplink for each Coast	$ 400,000	
Annualized Uplink Expense	$ 56,950	
Increased Maintenance Expense	$ 20,000	
Per School Annual Uplink Expense	$ 1,539	
Total Annual Satellite System Expense per School		$ 47,539
Total Distribution System		----------
Student Provided Equipment T.V. Set		
B.W. $ 80 Color $ 200		
Useful Life	5 years	
Annual Cost	$ 16/40/yr	
Average Number of Students per School Served by System		3,500

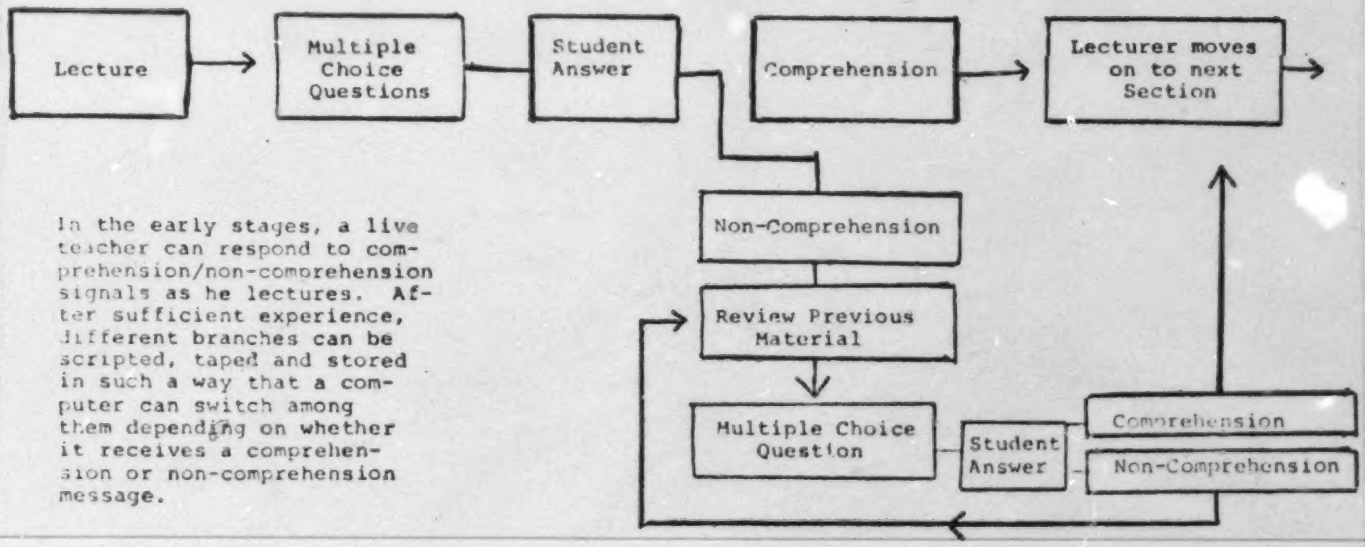
TABLE III

COST COMPARISON PER STUDENT

CONVENTIONAL APPROACH		EDUCATIONAL SATELLITE DISTRIBUTION SYSTEM	
		Total Annual Satellite System Expenses per School	$ 47,539
Total Annual Building Cost	$1.441M	Local Distribution Expense if Franchise Requires Free Educational Channel	$ 0
Utilization	1,250 Students	Number of Students Served (Assuming Oregon State	
Annual Cost Per Student Year	$1,153	experience is typical)	$ 3.500
		Satellite System Cost Per Student Year	$ 14
		Total Annual Per Student Cost	30-54

ILLUSTRATION IV

INTERACTIVE ELECTRONIC EDUCATIONAL DISTRIBUTION SYSTEM LECTURE



In the early stages, a live teacher can respond to comprehension/non-comprehension signals as he lectures. After sufficient experience, different branches can be scripted, taped and stored in such a way that a computer can switch among them depending on whether it receives a comprehension or non-comprehension message.

ILLUSTRATION V

INTERACTIVE MUSIC PERFORMANCE INSTRUCTION

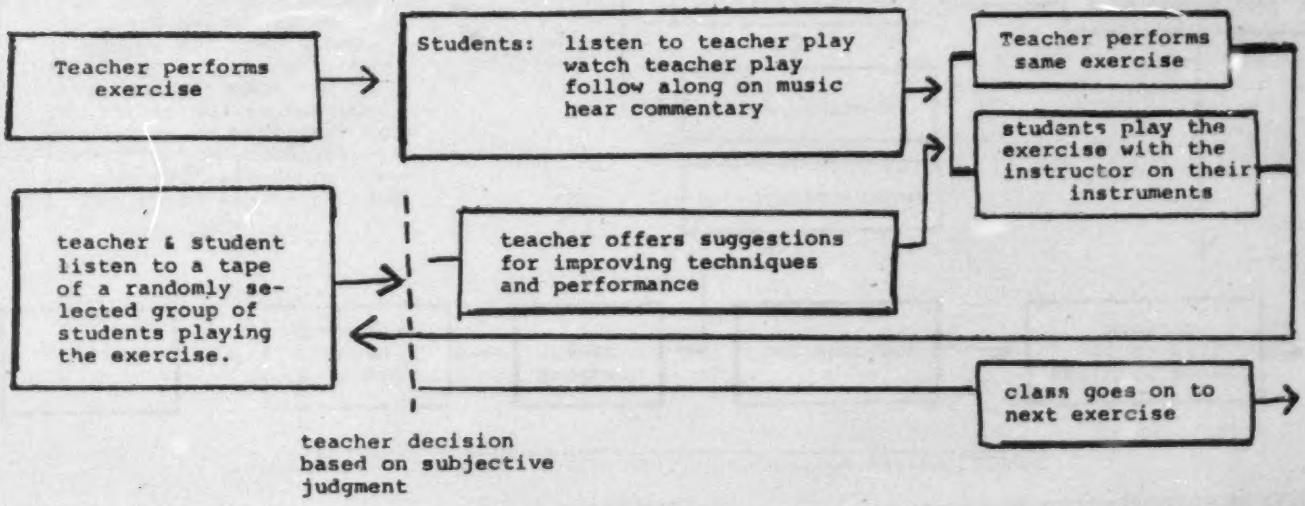

Teacher performs exercise
Students: listen to teacher play
watch teacher play
follow along on music
hear commentary
Teacher performs same exercise
students play the exercise with the instructor on their instruments
teacher & student listen to a tape of a randomly selected group of students playing the exercise.
teacher offers suggestions for improving techniques and performance
class goes on to next exercise
teacher decision based on subjective judgment

TABLE VI

MARGINAL COST OF UPGRADING ONE-WAY SYSTEM TO TWO-WAY INTERACTIVE MODE

Computer for switching and data aggregation	$10,000/yr.
Terrestrial Line for Feedback	2,400/yr.
Up-grade one way distribution system to two way	.....
Student Provided Equipment (touch tone phone)	$2.50/mth.

A PROPOSED NATIONAL COMPRESSED TIME INSTRUCTIONAL TELEVISION DISTRIBUTION SYSTEM

Presented By

Robert L. Nelson
Westinghouse Electric Corporation

In a November, 1974, workshop on "Educational Television Market Formation," sponsored by the National Institute of Education and hosted by Stanford University, the following assumptions were agreed upon by most participants:

> Communication satellites within two years can offer high power television distribution channels costing $4 million to $5 million per channel year. These satellites will nationally distribute television programs to ground receiving stations costing $5,000 to $10,000. Satellite rental will range from $500 to $1,000 per channel hour for national television distribution.
>
> At the satellite receiving site, the television signal can be directly distributed to the classroom, community learning center, or cable television channel. Or it can be recorded on tape for one or more later playbacks to suit local schedules. The tape would then be reused to record a subsequent program. Either direct or delayed replay eliminates the large inventory needed to nationally preview and distribute material by mailed film or tape.
>
> Television lectures are effective in teaching in the great majority of adult education subjects. In most cases TV is most effective when used in conjunction with faculty conducting problem sessions and discussion and providing counseling. Well prepared textbooks, opportunity for student interaction and out of class work are also typically required. TV replaces recited lectures but not the other components of teaching.
>
> The quantity of material and need for schedule flexibility will prevent broadcast television from playing a major role in ETV expansion. Local distribution will be done by a combination of cable television, direct reception in colleges, hospitals, factories, etc., and community rebroadcast with mini-transmitters.
>
> Local cable television operators may be expected to finance the purchase of low-cost satellite receivers and provide channels for educational programs. However, in the next few years they cannot contribute to programming costs. In later years they should contribute to programming if they benefit from its showing.
>
> Production facilities of public television, especially those related to colleges, will play a significant role in the growth of ETV. These facilities should be available to produce material that is sold to national distributors or to other institutions.

Each of these assumptions below will for the inevitability of the broadcast satellite as a new, more efficient way to service the needs of our widely dispersed colleges and universities. A cost effective network and the technology of television could be the driving force behind a cooperative National University Program.

The value of such a network which can interconnect the educational community could be further enhanced by a recently implemented technical development by Westinghouse. This development known as VIDAC[TM] has been under development for the last five years and has operated experimentally over a state educational television network as well as the ATS-6 satellite.

VIDAC[TM] (Video Audio Compression) is a color still picture (variable rate) television system which makes possible the distribution of television programming in compressed time over any conventional television channel.

One hour of average VIDAC television can be transmitted in about 10 seconds. This means a single channel of open circuit TV, CATV, closed circuit TV or satellite TV can handle 360 times as much VIDAC television as conventional TV programming.

Once programming is time compressed by the VIDAC program processor, it may be recorded on conventional video tape. Because of its compressed nature, however, 1,000 average 10-minute programs can be recorded on a single one-hour reel of tape.

The increased capacity made possible by compressed time television makes possible the delivery of programming selected by individuals or groups for viewing when they want it.

A single compressed time video tape library can service any number of receiving terminals so that it is not necessary to purchase separate audio-video libraries for each user location. A single library could service the nation, a state, a metropolitan area, or a single university campus depending on the network design.

The key requirement to implement a National Central Library System is a national network capable of carrying at least one television channel. At present the only existing network available to the educational community is the present PBS network. This network presently operates during the day and evening hours. After hours the network is dark.

We propose that a study be funded to develop a plan for providing a supplementary programming service nationally, capable of servicing ITFS systems, educationally operated CATV channels, school campuses,

learning centers, libraries, etc. Even a national (and…national) still picture television library. This library would be transmitted each night during those hours when the network is not busy at the rate of about 1,000 television programs per hour. At about 1,000 television programs per hour. Such a transmission would tie up a single video tape recorder and an operator each night at PBS headquarters and have the network busy and operating during those accessly dark hours.

The cost of this transmission including the single tape player, the operator, and perhaps the additional costs associated with leasing station transmitters on the air could be borne by a national funding source. (This is equivalent to making the library available to all participants who are now receive a satisfactory signal from a PBS station.) Then each local user group who wishes to use that library each night and dicate programming at its choice for use the next day need only connect to a terminal to acquire and play back through the CATV channel, CATV channel, school ETV channel, or other local distribution system.

When an operational broadcast satellite comes on stream, the costs associated with operating the individual PBS station transmitters after hours would no longer be necessary since the satellite transmission could be received directly by all users. This means that the stated cost of operating the national library would be further decreased.

Such a system accomplishes a number of things:

1. A single high quality library of programs, maintained at one location and funded by a national source, could be maintained to an up-to-date condition. Accessibility to programming in that library is provided to all receiving location throughout the nation on an overnight delivery basis.

2. The local user group has available one program newsreel of the national library. (The principal economy in the use of closed circuit instructional television is the financial burden of acquiring timely, quality software.)

3. The local user group controls the program selection and scheduling of its expanded view program origination capability. This means local economy is maintained even though a national library provides the resources.

4. Growth of the system can be gradual and orderly. When the library exceeds the available nightime transmission's time, half the library could be sent on each of two successive nights-providing delivery in 48 hours but doubling the program choices. When the advertised satellite becomes available as a replacement for the PBS net, multiple channels of compressed programming could shorten the access time and increase the library size.

   As service is continued, usage will grow in an orderly manner as more and more user groups decide to tap the service. The operating requirements at the national library is not change whether one user location is served or a million are served. Hence as to when to tap the system, that

programming to acquire, when to play the programming, and whether to distribute the acquired programming directly from the broadcast feed or record it locally as a tape recorder are all local decisions.

5. Because the library would service a wide variety of specialized needs as opposed to the broad mission programming carried on the current PBS network, programming could be expected to come from many sources. Program production costs of compressed time television are only a fraction of those for conventional television so that production of specialized programs could even include non station groups and sponsorships.

Although TIDAC is not yet a commercial reality, it is past the feasibility stage. Experimental models were used over a period of 18 months to transmit about libraries during non-business station breaks on a state wide educational television network. That same equipment was used to acquire newsreels material libraries 18 hours of nonstructured ETV from Denver to Dallas, Georgia, over the 2000-6 experimental satellite. In addition to compressed audio/visual programming, compressed control material associated with the program can be stored and transmitted along with it. Connecting a broadband computer to the TIDAC receiving terminal allows for recorded time printouts. A networked TIDAC receiving program will operate a telephone for 24 minutes.

Since TIDAC compressed television moves the PBS standards for format, an inventory of existing audio recorders or TV cameras is necessary to determine what type of programming. The key requirement is the establishment of a national user organization that could plan and operate the satellite library. Individual users could be expected to fund their own terminals and expanded view distribution systems.

TIDAC programs are made up of commercially Enhanced video frames and audio frames. The audio information frame is a new concept and requires the development of a national format before equipment to produce and programming is processed on any scale. A number of equipment builders could be licensed to build terminals in accordance with the national standardized format and operation could then commence.

[illegible]

A SYSTEMATIC APPROACH TO QUALITY IN TELECOMMUNICATIONS FOR INSTRUCTION

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University of South Carolina
Columbia, S. C. 29208

Abstract

The advent of highly organized technical delivery systems for televised communication has caused a rush to utilize the systems for increased enrollment. There are, however, many problems related to this rush to reap the benefits of this technology. Among the problems is the relegation of quality to a lower order of priority than quantity.

This paper offers a systematic approach to the problem of quality with quantity through the marriage of content with advanced technology. The system is based upon the use of needs assessment, objective stating and content development, careful production planning, review, implementation, and evaluation. Within the limited confines of the paper, the approach is described as a way to gain the full value of content through the use of both print and non-print media.

Each medium is used to accomplish those things which are most fitting to that medium. Talk-back television is shown as inefficient, while carefully produced television tapes are shown to be economical in terms of long termed values. Every effort is made to give direction and to state a position. The paper is not intended to be data based, but it is based upon extensive experience in the development of successful college level courses of study for television.

This paper is a point of departure rather than an answer. The basic intent is to relate demonstrated educational practice to the problems of televised instruction. The use of quantity as a source of support for the use of telecommunications in education cannot last unless we attempt to insure quality in our products.

* * * * *

The sophistication of technology and the development of superior delivery systems for televised education and communication has opened a new era for college and university instruction. In recent years we have all become increasingly concerned over declining enrollments and have sought new methods to solve this problem. Satellite and cable telecommunication systems make it possible to enroll students in courses and programs who were unable to do so in previous years.

The University of South Carolina, for example, has enrolled students in both closed circuit and broadcast courses. Courses are offered in history, engineering, business administration, political science, nursing, education, and psychology. Students are enrolled in courses beginning in their senior years in high school through advanced study in graduate school. Courses are offered with adjunct instructors at field sites and to students in the comfort of their own homes. Enrollments have implied a high level of success for these productions. However, there has been little said about the quality of these courses. Review of numerous television courses at the college level has indicated that there is little beyond the talking face in many such courses across the nation. We have not utilized the potentials of the medium when we televise lectures. This is a statement of fact.

We have spent enormous sums to provide the technological capabilities for quality production and distribution. Each system has long hours of planning and evaluation dedicated to the development of the best possible system. At this point we face a major breakdown. We do not make the serious effort to insure the highest possible quality in what we deliver through the system. Our rush to increased enrollments and full use of our systems has led us to become more directly concerned with quantity rather than quality.

The pursuit of quality instruction which will have lasting value and cost effectiveness has led to the following approach to televised instruction. This approach is based upon long experience with televised instruction at the college level, and it reflects lessons learned from these experiences. The process is based upon several basic assumptions which are:

1. Television and media can instruct, motivate, and expand the scope of instruction.
2. Electronic media cannot do the job alone.
3. There are more efficient means of information dissemination than telecommunications
4. The medium of television is outstanding as a delivery system, but it can be most effective when utilized in a systematic manner for specified purposes.
5. Mediated instruction requires intensive planning and preparation if it is to be successful.
6. Proper use of television and media can give instructors more time for their own work if they are willing to invest more time in planning and development.
7. Most persons involved in instructional media start off with a level of ignorance in relationship to some aspect of the project. (i.e. Content specialists do not know production; producers do not know content.)

The approach we have developed is aimed at using the medium of television to its fullest extent, while gaining effective efficiency. All television production requires the active participation of numerous people. Each of these persons has a major role in the developmental process. The process itself has seven steps: content preparation, strategy development, review and revision, distribution and evaluation.

No course should be taught unless it fulfills certain criteria. These are:

1. The course must fulfill the needs of those who will be enrolled.
2. The course must produce measurable changes in behavior which are pre-determined
3. The course should be a part of a well planned curriculum which fulfills the long term objectives of a given program or should be offered as a non-program course designed for a specific problem.
4. The course should be replicable.

Using these criteria as guidelines, the process for development should begin with the assessment of needs.

Content Development Component

Content must reflect objectives which reflect needs. Therefore, in our scheme of things, needs assessment is a starting place. In essence, we must ask a simple question: "What are the needs of a specified group of potential students?" These exist on two levels, one being those needs people feel they have, and the second level being those needs people truly have. The approach to this problem can be quite complex, but the system developed here calls for the use of survey forms. The survey population should be drawn from two groups, potential students and persons who have been successful in the field under consideration. Both of these groups can be compared to reflect the needs of the students.

Data collected from potential students will supply felt needs. If the course or program to be developed does not reflect these felt needs, students will not utilize the course. Data from experts will supply the planners with information on what is required for success in the area. The comparison of these two should bring about a statement of real and felt needs upon which specific objectives can be based.

The objectives should state what the student will do, under what conditions, and the criteria for evaluation. They must also reflect the identified needs. Once the process reaches the level of specific objectives, the content specialist becomes heavily involved. It is his task to determine what content will be required to produce the results stated in the objectives. The content must be prepared in written form and be related directly to objectives. The content team need not concern itself with strategy, for strategies will be developed in the pre-production planning. Once the full content is developed, each member of the pre-production planning team will be given a copy of the content.

Strategy Development Component

The major task of the pre-production planning team is to develop the most effective teaching and television strategies for the content. This team should include both content and production people. Content experts should be given training in television, and the production people should familiarize themselves with the content.

Outcomes of this effort will depend on the ability of each group involved to express their specific knowledge to the other. Each objective, sub-objective, and content point will be looked at as something that can be expressed most effectively and efficiently in a given way. The team will determine what can best be done by all of the possibilities available. The use of television must not limit the use of audio tape, film, film-strips, and the printed word. Television is the expander, the exciter, and the informer. The impact of television is far greater when it is used effectively. Our plans must include the knowledge that television is seen as an entertainment medium, and the transition to television as instructional tool is not always a simple switching of mind set.

Thus, in our planning we must identify those factors which need to be actively viewed and discussed and delete the boring detail from our television presentations and reserve the more exciting portions that will stimulate and motivate for television. In a sense, television should be used for those things that should be seen and heard. Anything that can be covered by straight lecture can be covered on audio tape or in print. Using television for such work is both extravagant and ludicrous. It is terribly expensive and turns people off.

The team will gain from having both content and production people in many ways. There is a need for both types to look at what is to be done, for both to have an interest. If the content becomes too shallow, the content people will catch it. If production ideas exceed the potential of available equipment, production people will catch the problem before it becomes a major error. The creative producers, however, will generally serve to expand possibilities for content persons.

The products of this team are multi-faceted, for they involve the total production effort from printed matter to the television program. They also keep the package together as a unit so that each piece has a specific role which does not duplicate efforts. The products should include:

1. Television scripts or script outlines.
2. Workbook materials.
3. Audio scripts.
4. Specific areas for each portion which allow for evaluation of the product in terms of the medium used.

Production

At least one content specialist should be totally involved in production. The interpretation of scripts

can lead to the obfuscation of the content which is supposed to be contained. Therefore, the content specialist has the last word on the effectiveness of a scene to get the concepts across. The role of the production staff is to create the most effective communication and to assure its technical excellence. They are not to judge the quality of content.

Included in production are the other media to be used, including the printed materials. Content and learning specialists must be certain that the materials communicated will achieve the objectives which have been set. Thus, each person on the planning committee has a definite role in production activities.

The marriage of content and production allows checks and balances which should result in higher quality of production while maintaining better content. Once production starts, the review and revision component starts.

Review and Revision Component

Our review and revision is often after the fact. We waste time, money, and effort if we do not establish a definite review schedule. These reviews should be carried out by a select panel including:

1. Content scholars.
2. Learning specialist.
3. Production specialists.
4. Potential audience members.

The schedule of reviews should begin with the completion of the very first product and continue until all products are completed. The panel should look at the quality and level of content, production, and applicability of the products.

One can best describe this group as a quality assurance group. They should not be directly involved with the early planning nor with the production, but they should be able to render unbiased opinions. When this panel finds an area that should be revised, the products and content team should review the area and make a determination of how the task can be accomplished.

Once a decision is made the production will continue, but the revision made in the previously produced material will be included. The steps in the previous components should eliminate many problems, but the need for external review is always there.

Distribution

Distribution of materials is a process that requires careful management. Students must receive the materials required for success and be able to use them. Therefore, it must be determined if the students will require any definite assistance in the field or if the materials allow them to be self directing. While self direction is desirable, we stand the risk of losing effectiveness. Therefore, care must be taken to insure that student needs are met.

The delivery system can include the mail service as well as the cable or satellite telecommunications system. Installing a toll-free incoming WATS line for emergency situations can often decrease the need for on-site instructors. Talk-back television is used in some institutions, but this system does several things to the efficiency and effectiveness of the programming:

1. It requires the use of broadcast time to answer numerous simple questions which could be answered by telephone.
2. It decreases the value of taping programs in advance for the fullest use of the medium.
3. It does not allow students to receive assistance without extra cost when the program is not on the air.

These factors lead to the conclusion that much of the effectiveness and value of televised instruction is lost in those systems using talk-back. Talk-back also encourages traditional teaching practices which are not always the most effective.

If programs, on the other hand, can be video-taped for distribution, the instructor is freed from the same course semester after semester. He can turn his effort to tasks of working with individual students desiring or needing more help and the continual updating of his course. He loses the restrictions of being before a class at all times, and he can become involved in those tasks which can lead to increased productivity.

Evaluation Component

Evaluation of students is a necessary endeavor. With televised courses, the need for evaluation increases. Each part of the package must be reviewed for effective learning outcome. Since we have established a system for each part of the package, we are able to evaluate the effectiveness of each component.

Every evaluation should lead to improvement of the products and the delivery system used. Student performance will tell us how well we have done our job and will identify areas of need. Our evaluation cannot stop with students, however, for we must evaluate the content and the products.

If new content is required, we must be willing to revise the package to include that content. In a world which has achieved the level of research resulting in new knowledge we presently face, every course must be revised annually. However, the revision will affect only a small portion of the products used, and the rest of the course will remain static. Thus, the cost of revision will be less than the cost of total reproduction of a given course.

Conclusion

The potential gains of this system are numerous and the drawbacks relatively few. In comparing the gains and drawbacks, one should look at both quality and quantity. Looking at the approach with a long-range view, one can see that the use of video-taped courses adds to the freedom and quality of teacher-student relationships. Tape does not replace a teacher

student relationship. Tape does not replace a teacher; it makes of him a source of help and encouragement. Tape allows the teacher to utilize the medium of television to synthesize all of the available materials into a single package that can inform, enrich, and instruct students.

On the negative side, there is one major point, and that is the time required to produce high-quality instruction. The approach we have described does take time, more time than traditional methods. The time problem can best be answered by looking at the time as an investment. Invest time at the outset, and then watch your time grow as you gain freedom when the job is completed.

The system recommended here is one that can be used outside of television, but with television one must plan carefully and utilize the medium. Failure to do so will lead to the demise of this potentially powerful force. When one looks at the problems presented by the present conditions in our society and economy, one must look for alternative solutions to problems. Telecommunications offers a viable alternative -- but only when used effectively with quality as the byword rather than quantity.

THE NATIONAL HUMANITIES SERIES CABLE EXPERIMENT
"TOWARD A MORE HUMANIZED SOCIETY"

Presented By

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The National Humanities Series: Midwestern Center, located in Madison, Wisconsin, began operations on March 1, 1972. Funded by the National Endowment for the Humanities, it reflects a renewed national emphasis of developing programs at a grass roots level. It is an attempt to foster a dialogue among people about human concerns in a humanistic framework. The Midwestern Center organizes programs in Illinois, Indiana, Iowa, Michigan, Minnesota, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. During the past year, a variety of resource materials were developed including anthologies, a resource guide, a booklet on Discussing the Humanities, as well as independent study materials. In an attempt to reach new audiences and also encouraged by Richard Adler's The Humanistic Uses on Cable, the Midwestern Center decided to develop a humanities program for cable audiences. What follows is a description or report of the development, content, showing, and public reaction to the program "Toward a More Humanized Society."

With endorsement by Washington after the submission of a budget, contact was made in May, 1974 to arrange for a filming schedule at WHA-TV. From the very beginning, a mutual respect and willingness to learn prevailed and persisted throughout the working relationship. Although the two persons involved from the University television staff were somewhat skeptical about a dialogue approach sustaining adult interest, they were open-minded and willing to 'wait and see.' In the meantime the staff moved rapidly to identify participants in the program and to invite them to an organizational meeting on July 25, 1974. An attempt was made to balance young and old, male and female, minorities and establishment. The final group consisted of ten participants and the humanist discussion leader. There were two students, one graduate and one undergraduate, a grandmother and an active feminist were present. There was a Mexican lady, a black law student, and a black, equal opportunities person. A young male worker with a degree in counseling gave his perspective. A faculty member of University Extension in community leadership development participated. Although they had never been together before, the group soon established a rapport. Never envisaged as a confrontation group, they rather served as a model of a group of adults who were seeking to understand problems by discussing them from different points of view. Rather, we felt the emphasis should now be upon defining common values and breaking down some of the polarizations of our society. There was a modest stipend for participation in the program.

The group met for the first time on July 25 to discuss the problem and program objectives as well as to get to know one another and the studio staff. They accepted the theme of "Toward a More Humanized Society" and decided to discuss in the first program a passage on the "Child" from Kahlil Gibran's The Prophet and Jean Anouilh's "Antigone." The second component on "Women" centered on Henrik Ibsen's "A Doll's House" and Gwendolyn Brooks's "Farmer." The final one was to be an excerpt from Seize the Day by Saul Bellow and the segment on the self-actualized in Motivation and Personality by Abraham Maslow. The organizational meeting concluded with a discussion of Gibran's passage on childhood to permit everyone to explore its meaningfulness for the modern parent.

A quick, but significant decision was reached prior to filming to limit the three programs to one-half hour each. The format was dialogue, the content, a discussion of two passages each time, with each program briefly introduced by the humanist discussion leader who explained objectives of the experiment. Much to the amazement of everyone concerned, filming was over in six hours on two mornings. Editing took place in late summer and montage effects and musical background were added in the fall. The group excitedly watched during an October showing. Passages to be discussed, with the Maslow exception, were all superimposed on the screen and some were read while the group appeared to discussion in the background. The staff of the Midwestern Center and a critical audience from ten states attending a Madison meeting on the phase-out of the total project evaluated the program in early December of 1974.

Their reactions and those of the staff were most positive. There was general agreement on the following points. The three one-half hour films could serve as models for discussion. The relationship of the humanities to values and daily human problems was woven into the discussions. The programs definitely demonstrated how the humanist discussion leader could orchestrate the total group effort around a common theme. On the other hand, the need for wholesome conflict emerged. The music was sometimes distracting. Some wished participants had been identified, others felt the Maslow section needed a printed text on the screen. And finally there was a need for more of the 40-60 age category. But we were very encouraged to take the films out to a cable audience.

With the help of University Extension's Communications Department, contact was made with commercial cable stations throughout the state, the project was described, the objectives of the experiment stated, and they were asked to participate. A previous educational experiment on cable by University Extension has prepared the way. The following companies voiced interest and WHA-TV agreed to set up a system of forwarding films for preview purposes.

Ashland - [Badger CATV]
Bayfield - [Bayfield Cable TV]
Beloit - [Beloit Cable TV]
Madison - [Complete Channel T.V. Inc.]
Platteville - [Platteville Cable T.V.]
Racine - [Racine Telecable Corp.]
Stevens Point - [Teletron Cable T.V.]

These cable companies agreed subsequently to participate in the program and set up dates to their schedules. The Midwestern Center sent them publicity material together with packets in which selections to be discussed were printed and offered to conduct further discussions in the cable company offices if there was interest. Originally we had intended to use the companies' subscriber lists to identify a sampling group, but local ordinances prevented providing this information. Consequently we approached the students in my Research Laboratory of University Extension for a telephone survey. Two communities, Beloit and Bayfield, were selected as targets for urban-rural contrasts, northern-southern locations, and industrial-resort focus. Both had a large percentage of families with cable television. University Extension staff were notified, afterward, of the project.

The questions for the cable audience survey for "Toward a More Humanized Society" reflected a collective effort of the Midwestern Center staff and that of the Survey Research Laboratory. As previously stated, they were designed to assess public reaction to three specific programs and find out if there was interest in more such programs.

The Beloit and Bayfield programs were scheduled for March, 1970, publicized on the screen and in program announcements. The program at Bayfield, a small fishing and tourist area in Northern Wisconsin near the Apostle Islands, showed the three programs several times. These were in the evenings as well as on Sunday afternoon. Unfortunately the showing in Beloit was scheduled for holy week and not tricked to the television schedule of the Beloit Daily News. The telephone survey failed to reach a significant number. Here's how telephoning broke down:

Beloit

600	- initial number of cover sheets
-67	- not in service
-14	- commercial
-3	- non-samples
516	
-423	- hadn't heard of program
17	- had heard of program, didn't watch
11	- never answered
3	- refused to discuss
3	- others (hearing impaired)
1	- saw not answered questions

The one respondent would not submit himself on the First Three questions, answered yes to 4 and 7, selections to 6, and no to 9, 10, and 11.

The view from Bayfield was better:

401	- Cover sheets from the telephone book
-62	- not in service
-26	- duplicates
-13	- commercial
-3	- seasonal residents
297	
-206	- never heard of program
76	- had heard of, but had not seen
4	- refused to discuss
5	- never answered
6	- had seen and responded (one was the interviewer)

So the results are based on 6 viewers. What did we learn from them? A summary follows each question.

Question 1 - "Which programs did you see - circle, either, neither"

6	- All
1	- Either

Question 2 - "Which program did you like best?"

1	- Circle
3	- Either
2	- All
1	- No answer
1	- Other

Question 3 - "Why did you like this one best?"

1	- Circle - "More variety and better response"
1	- Either - "Activities were to this"
1	- Either - "Expressed lots of ideas and opinions. What I myself have"
1	- "Didn't really like any of them"
2	- "Liked all of them equally"
1	- Other - no comment
1	- Couldn't answer

Question 4 - "Which program did you like the least?"

1	- Circle - "More difficult to follow"
1	- Circle - "Way it was discussed, lot of incongruencies like through whole program, didn't like it at all"
2	- "Didn't dislike any of them"
2	- Box - "Was hard to understand the gist of this one man"
2	- "No response"
1	- Box - "Didn't really get into man"

Question 5 - "Would you like more such programs on cable TV?"

6	- Yes
1	- No

Question 6 - "Did you like the people appearing on the show?"

6	- Yes
1	- No

Question 9 - "Would you say that the people appearing on the program . . ."

2	- Always used words everyone would know
4	- Sometimes used words that the average person might not know
1	- Often used words which the average person would not know

Question 8 - "Would you prefer to if the

participants had been introduced to each?

1 = Yes
2 = No

Question 10 - "Did printing the meeting schedule on the program help you follow the discussion better?

1 = Yes
2 = No

Question 11 - "Would you like to participate in such a discussion in your own county?

1 = Yes
2 = No

What can one possibly conclude from such a skewed sampling of public reaction? More seems to be made public judgment in such programs. Time and circumstance would appear to permit perhaps a larger audience. At least more and better publicity. Essentially the programs need more reaction from a broader section of the small public before we develop any more programs. The wholesale approach is certainly not the answer.

[redacted]

ing and can demonstrate improved competence. The elderly (as we note already) will be encouraged to continue learning under higher subsidy as a means of enriching life and understanding, and of increasing communication between learners of different ages to compensate for the social dangers inherent in the shutting out of elderly people from normal social intercourse, particularly with youth.

Since learning will occur in the environment of the learner, wherever that is, many of the social, legal and financial procedures now in effect will be modified. The social-economic-political support patterns of tertiary institutions will be broadened as the implications of open learning are perceived and acted upon. Consortia, regional agreements, national networks of cooperation and collaboration will have new significance. The issue of local control of education will become less significant as responsibility for learning is more and more the prerogative of the self actuated learner. Again, independent study institutions will be able to accommodate to such changes with less trauma than others.

As noted earlier, even institutions which choose not to be involved in open learning will be the beneficiaries or victims of the changes implied in the trend we have been discussing. Quite obviously the benefit that many seek is the achievement of a "learning society", as so eloquently depicted by Robert Hutchins and Edgar Faure. (24)

The implications of the open learning trend for tertiary education are, of course, speculation, but let us hope that they are at least intelligent speculation, even though intelligence, as the French mathematician Emile Picard observed, "is that faculty of the mind, thanks to which we finally understand that everything is incomprehensible." (25)

The open learning trend is a child of independent study. It affects its parents in significant ways. This child, in fact, may win the acceptance so long denied to its parents. This, in itself, will have a significant implication--as suggested here--on virtually every aspect of our work.

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COMMITMENT TO INSTRUCTIONAL DEVELOPMENT: IMPLICATIONS FROM RESEARCH AND EXPERIENCE

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The important question in terms of instructional development in higher education appears to be whether it is feasible to expect major changes in undergraduate instruction in "established" institutions. Nevitt Sanford (1967) is quite right in recognizing significant dichotomy emerging among those concerned with change at institutions of higher education. While some point out that changes do occur, critics are quick to add that changes are usually superficial in established universities. Only extremely rapidly growing institutions, small institutions, and new institutions seem to have produced important organizational and curricular improvements. But what about the established university? What about universities that have been termed "mature institutions"? What about the future of higher education in the light of the universal budget squeeze? These questions are a true challenge for those concerned with change in higher education, with instructional development, and with the too-often forgotten student. A surface view of the situation today does not appear to encourage optimism. Years of structural rigidity in higher education, emphasis upon faculty research and lack of concern with the improvement of undergraduate instruction cannot be overcome in one great act or proclamation. However, in understanding the roots of the present dilemma, one can begin by looking at the historical view of the university student and the university instructor. The predominant characteristic of both has been autonomy (OCDE, 1974). The concern with maintaining this traditional autonomy has meant the minimization of intervention. This strategy has historically resulted in satisfactory performance by society's criteria. However, today the prevailing view of higher education is changing, and we are no longer thinking in terms of satisfactory performance as ultimate criteria of evaluation. Today, we are beginning to think in terms of optimization of performance, both in terms of economic and social criteria. And indeed we should. We have entered an era of accountability, and this need for accountability has led us to think in more business-like terms of optimization of resource allocation, institutional change, and instructional improvement.

Instructional Development has been a relatively recent response to calls for change in higher education as a result of economic factors, societal displacement, student dissatisfaction, and growing concern for universities as teaching institutions. But, what is instructional development? Is it applying a systems model? Why does university instruction need development? There appears to be little consensus on these issues. The most glaring deficiency in attempts at instructional development has been the haphazard nature of most efforts. More often than not instructional development has been token in nature.

Let us assume that instructional development can refer to any process which can lead to the improvement of instruction. The first question that must be answered, and answered with the maximum of clarity, is why such improvement is needed. Wilbur Schramm has consistently pointed out that innovation without specific need is doomed to failure. Researchers have come to the painful conclusion that one type of instruction is no better than another type in all circumstances. Generalizations concerning curricula and media have led to constant frustration when implemented. Certainly we are beginning to think about optimization of resources and instructional improvement; but where, why, and how? We must come up with better reasons for instructional development than simply improvement of instruction, better teaching, and other abstractions.

If we can learn anything from the experience of others, it must be "specificity." Experience seems to indicate that most failures have resulted directly from a lack of specific needs, organization, structure, and mandate.

The recommendations in this paper were the result of a review of the literature on recent attempts at instructional development. The recommendations fall into the following general categories: planning, organization, personnel, and evaluation. These areas seemed to have caused great confusion in previous efforts elsewhere. The confusions related largely to the lack of definitions of precisely what instructional development means. This is the principal finding: defining instructional development in higher education cannot be in terms of generalizations; it must be a specific application in response to specific needs. However, without an awareness of the specific needs, instructional development is doomed to failure. Therefore, it is absolutely necessary that institutional needs be established before the instructional development program is defined, for these needs will largely determine its nature.

Likewise, only in the context of a needs assessment can we start thinking of organizational priorities, defining positions of responsibility, committing resources, and specifying functions. It is recommended that a needs assessment be undertaken, including as many interested parties as possible: faculty, students, administrators (at all levels), professional staff, etc. There must be an understanding of where instructional development is going to fit into the university, and this should probably result from an inventory of institutional needs and priorities. A comprehensive and specific response to a needs assessment should define instructional development priorities for that institution, in the context of institutional planning, expectations, and past experiences.

Another major flaw has been the failure to institute a system of communication between those involved in and concerned with the improvement of instruction. Prior to instructional development, there should be an effort to locate interested persons, particularly those with past experience and expertise that might be tapped. There are hidden resources, particularly human resources, at this, and every, university. Departmental isolation is still one of the great hindrances to instructional development in higher education.

Lack of incentives for faculty to engage in instructional development projects has also been absent in most previous efforts. This is usually the result of the failure to "institutionalize" instructional development. There should never be any doubt of the institutional commitment to improving instruction; and instructional development should be recognized as a legitimate faculty activity and rewarded accordingly. The possibility of released time should also be considered, since instructional development is often a full-time activity, if it is done properly. However, this issue, and most others, derive directly from the usual failure to undertake a satisfactory needs assessment and establish priorities.

The information available in the literature indicates firmly that instructional development cannot be a half-hearted effort; there is no future in token efforts. Instructional development must be an established part of the institution, not an institutional appendage. It also must be realized by all concerned that instructional development takes much time and patience. There are no short-cuts to well conceived, carefully planned, organized, implemented, and evaluated instructional change. Anything short of this type of effort will not provide the self-perpetuating growth center that is needed in university centers today. Commitment to instructional development is not an advantage; it is a necessity.

Experience at other institutions in instructional development seems to indicate that the major problem areas have been:

1) Lack of administrative support
2) Unclear job description of the instructional developer
3) Lack of specific needs assessment
4) Failure to survey the characteristics of faculty and students
5) Unclear institutional objectives
6) Lack of communication network between faculty and administration
7) Lack of clear incentives for instructional improvement
8) Lack of financial mandate
9) Unclear concept of the future of the institution
10) Unclear chain of command in instructional development
11) Lack of concern for futures in higher education
12) Failure to communicate with other institutions undertaking instructional development and learn from the errors of others
13) Failure to attract people of sufficient quality into the key instructional development positions
14) Unrealistic commitments resulting in faculty frustration

Instructional development should be an overall policy decision, not isolated projects (Diamond, 1973). Although some recent successes have centered on the course development in specific programs, like those of Postlethwait and Keller, such efforts require strong, concerted efforts which few instructors are willing to undertake. Instructional development on an individual basis requires almost full time work on the part of the instructor in order to be successful, not only in the planning and development stages, but also in revision and evaluation. In Postlethwait's case, this process has taken the better part of the last ten years.

As an overall policy, instructional development can be institutionalized. This seems to be the direction in which the literature is pointing us. We must be extremely careful that we do not make the same mistakes that have been made in the past; the stakes are high indeed and may determine the viability of the university as a teaching institution. The primary generalizations, derived from the literature as recommendations for the future are the following:

Planning

1) Instructional development should be carefully defined for the needs of the specific institution in which it is proposed. There is no such thing as a universally applicable instructional development model.
2) Instructional development should consider the changing nature of higher education, changes within the institution, and a conception of where the institution will be in the near future. Instructional development is a lengthy process and will be completed in the "future"; this future must be understood.
3) The characteristics of faculty and student must be carefully understood, and must be considered crucial to the development of instructional objectives. These characteristics must be specific and operational.
4) The instructional development at other similar institutions should be carefully evaluated.
5) There must be a general awareness, among all those to be part of the instructional development process, of institutional and subsystem priorities.
6) There must be a general awareness of three stages of instructional development: development (planning), production, and evaluation.
7) Instructional development should be free of any commitment to specific media or even media in general.
8) There should be a survey of methods available for use in the instructional development process. This way instructional development will not have to be committed to only one approach, as often occurs.
9) There must be an ongoing commitment of resources for instructional development. It will be difficult to maintain enthusiasm among faculty, if there is the threat of losing funding in midstream.
10) There must be some understanding of what types of payoff instructional development is to return and realistic criteria for its evaluation.
11) There must be an objective and equitable policy for funding instructional development projects.
12) There should be an understanding that the existence of an expert "change agent" is not a sufficient condition for instructional development, although it is a necessary one.
13) Instructional development should occur at the administrative levels, rather than at the "service" level; credibility, power, and incentive are absolutely prerequisite to successful instructional development.

Organization

14) There should be an institutional framework for instructional development, as well as an institutional mandate for it.
15) There should be an institutional procedure for bringing resource people into the instructional development process, particularly in planning for change.
16) There must be an established program of incentives for creative teaching and instructional development. However, care has to be taken so that there are not initially too many "clients" to be satisfactorily served.
17) Planning for instructional development could be the province of a committee of decision makers in the administration, in consultation with the faculty involved. The instructional developer should be part of the committee.

Personnel

18) The instructional developer should be free to devote all his time to administrating. There appears to be no advantage for the instructional developer actually participating in the "teaching" process (the "hands-on approach").
19) The instructional developer should have a broad knowledge of curricula in higher education, should be an efficient administrator, and must be able to command the respect of "media people" without necessarily being one himself.
20) The instructional developer must be paid accordingly to his responsibilities. There can be no thoughts of saving pennies here. The instructional developer must be first rate, otherwise the instructional development program is doomed to failure. This seems so obvious, but failing to heed this has led many times to failure.
21) The instructional developer should serve as an official "advocate" of program change and must have the opportunity to regularly interact with administrators concerned with the future of the instructional program: all of them.

Evaluation

22) Some sort of university-wide communication structure should be set up for feedback on the instructional development efforts and information about its successes.
23) Both cognitive and affective goals must be considered in evaluating instructional development.
24) Evaluation must be an ongoing process, starting at the very earliest stages of planning and never ending. There must be sufficient evaluation skills possessed by the instructional developer, with further resource persons readily available to help.
25) Instructional development must be systematic, but an instructional development system is not instructional development.

The decision to undertake comprehensive instructional development is a hard one to make. It represents a major institutional commitment. Having researched the literature in the field, I think that I can say, with some authority, that instructional development must occur on a relatively large scale in order that it become a vibrant force within the university. Otherwise instructional development will be relegated to a low priority position and will be handled on a project-to-project basis, without dynamic interaction between university components. The potential of instructional development for revitalizing a university is virtually unlimited; but it must derive from a deep concern for improving instruction, particularly on the undergraduate level. At a time when universities are beginning to rethink its priorities, the opportunity is available to discover whether instructional development should be an important part of these priorities or remain a neglected concern in an uncertain future. Instructional development really responds directly to the great controversy in higher education today over whether the university is primarily a teaching or a research institution. But the two are not necessarily opposed. Ideally the university should be a center of scholarly activities and fine teaching.

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AN EVALUATION OF INTERACTIVE CABLE TELEVISION IN ELEMENTARY EDUCATION

by Douglas Brown, Project Director
Dr. Gary Ackerman, Evaluation Associate
Charles Public Schools, Charles, Minnesota

The purpose of our study was to evaluate the effectiveness of two-way interactive cable television in a secondary school setting.

In an 8th, four subject areas, general science, mathematics, language arts and social studies, were used. We used four classroom groups of 7-1 to 30 students in each of the subject areas.

The first experimental group (E1) was in a classroom with an instructor providing the lesson, in that and a remote class. The classroom was equipped with a television camera, microphones and monitor. The second experimental group (E2) was in the remote classroom. E2 had no teacher present but utilized their television camera, microphones and monitor with the aid of an audio visual technician to interact with their instructor and E1 subjects located in another room.

The third experimental group (E3) viewed a pre-recorded video tape of the same subject matter and presented by the same instructor as seen by E1 and E2.

The fourth group (C) was the control group. This group was a random statistical sample of students not participating in any of the experimental groups.

The experimental groups and the control group were administered the Eysenck's "Multiple Affects Adjective Checklist", and the Junior Eysenck Personality Inventory at the first Personality Inventory because of the age of the subjects. The subjects "End Educational Achievement Test" scores were also collected from their school records.

A 30 hour training program was provided those teachers who took part in the experiment. This was in the form of a 7 credit course that applied to the teachers' salary schedule. The teachers' course loads were not lightened. Some of the participating teachers were experienced in instruction via television. The training program showed them how to use video and wrote lesson plans for the unit to be presented during the experiment.

The subjects were given five hours of orientation, one hour per day, on the equipment, purpose of the experiment and administration of tests. The week following the orientation, the subject matter was presented to groups E1, E2 and E3 in five one hour class sessions.

In the week following the presentation of the subject matter, all groups, E1, E2, E3 and C were given a subject matter post test. Groups E1, E2 and E3 were asked to complete the "Multiple Affects Checklist" observing moods that have associated the effect of the instruction.

All of the subject areas, general science, mathematics, language arts and social studies followed the same procedures.

Following the gathering of this information, it was run by Total Information Educational Package (TIEP) through the computer facilities at the University of Minnesota in the Statistical Package for Social Science (SPSS).

Anticipated Results

There will not be a statistically significant difference in the mean score change between the post test scores of E2 and E1 in each of the subject areas covered.

There will be a statistically significant difference in the mean score change in the post test scores of E1 and C from E1 and E2 in each of the subject areas covered.

Because the results were received from the computer just before we left for this meeting, a complete interpretation of the results is not available at this time.

However, our anticipated results were attained at the .05 level of significance in language arts, science and mathematics. The same results were obtained in social studies but at the .10 level of significance.

Our expectation was similar to the national norms for the composite score on the Educational Achievement Test. A one way analysis of variance on the composite scores had us to accept the null hypothesis of no significant difference between the groups or within the groups.

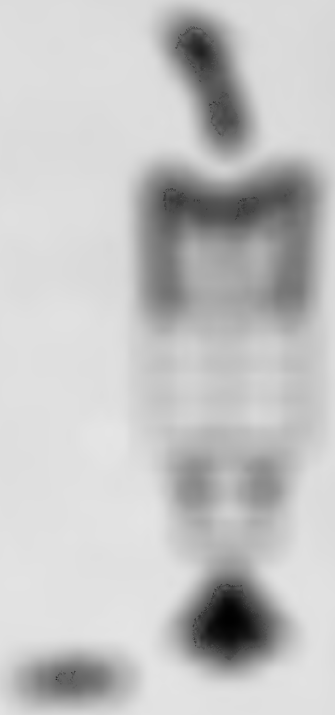
Now, in order that you may learn about some of the other variables studied and ask some questions, I give you Dr. Gary Ackerman, who worked as an evaluation consultant with us.

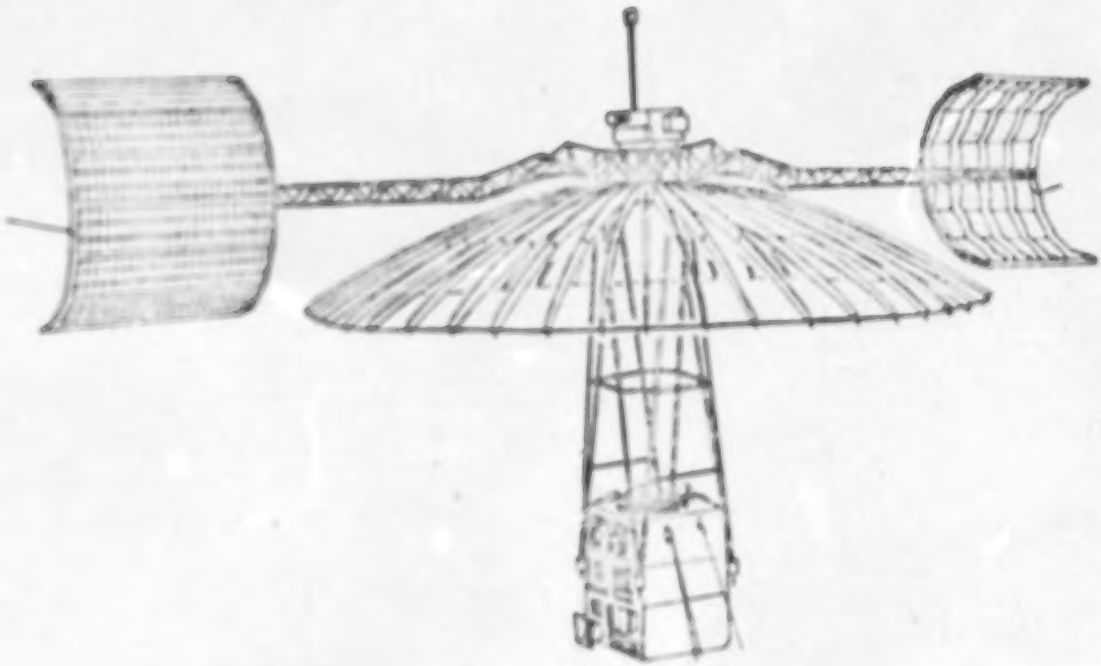
Because of all the work involved, when the results started to come out of the computer, it was rather exciting. I was curious about what happened in a classroom, under what conditions it was going to be different from another and what factors would make this difference. Are there personality factors interacting with the teacher and the students which among the students themselves that would affect the performance of the class? The other question was, what is the interaction with the teacher or what did the students see happening with the teacher?

We learned that extra service and the Social Studies scores are related to performance in a two way multivariate situation, E1. The accepting student, were open to his performance and competence to succeed. Students wanted to do well because in the two way situation. The students who were willing to participate and did, was the student who performed well under those

[illegible] [illegible] [illegible] [

[redacted]





ETS-11

Figure 2 ETS-11 Ready to Operate

Figure 3 The General Area of Coverage of ETS-II

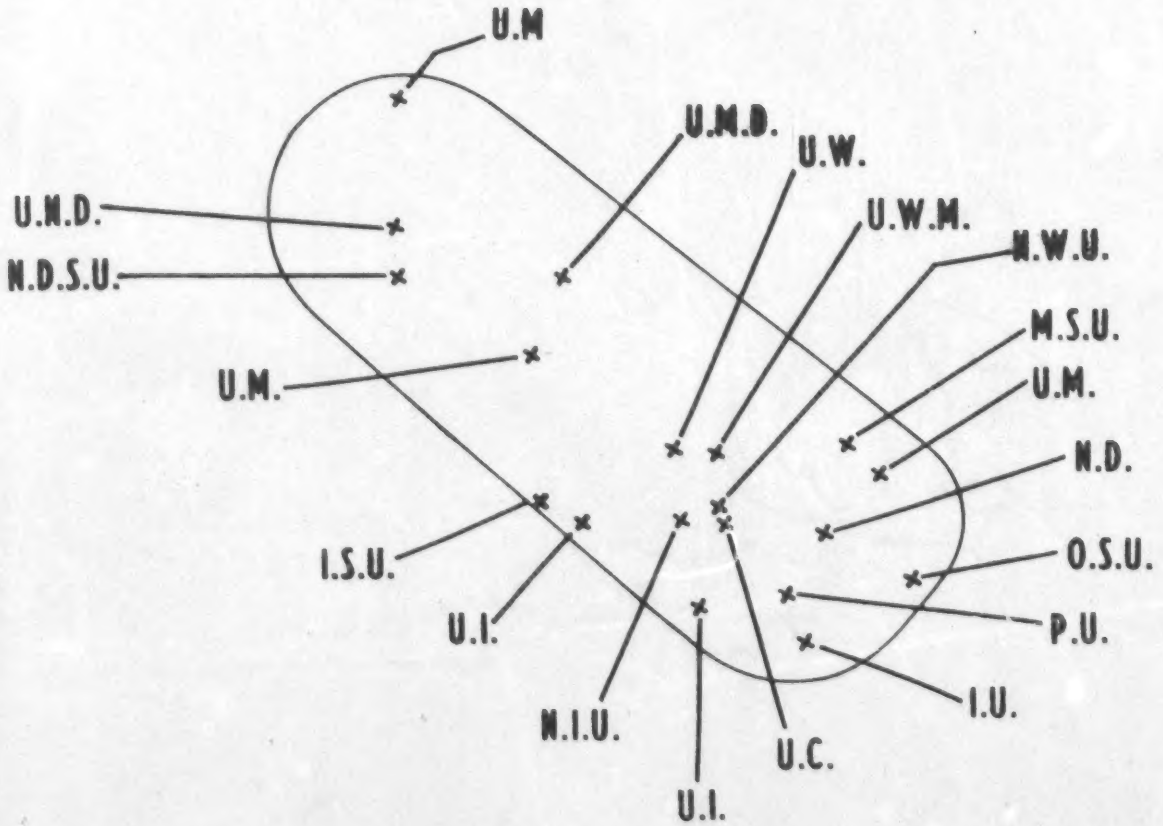


Figure 3A Examples of Universities Covered by the Footprint of ETS-II

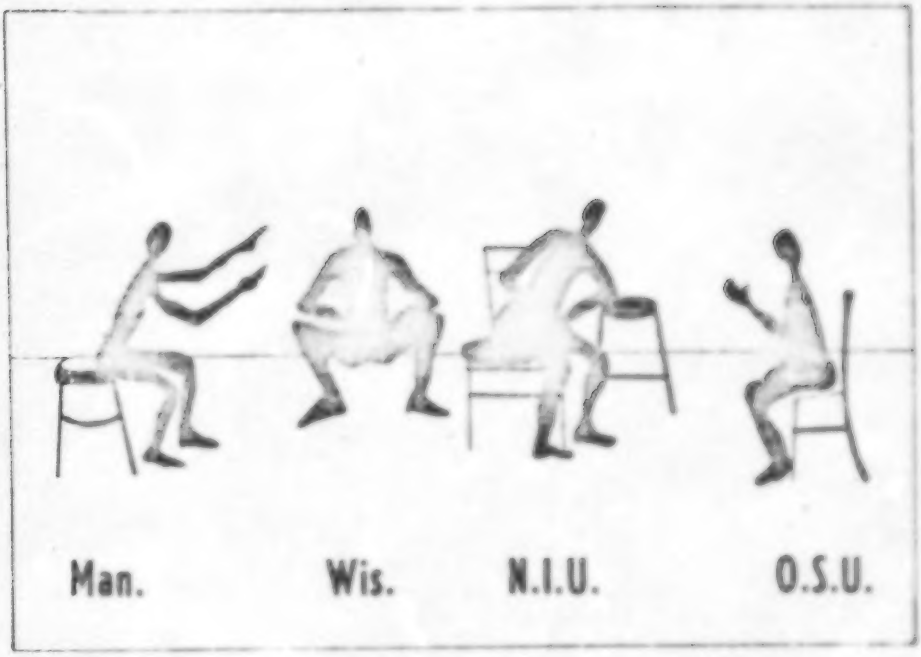


Figure 4 An Example of A Video Place Seminar Among Universities

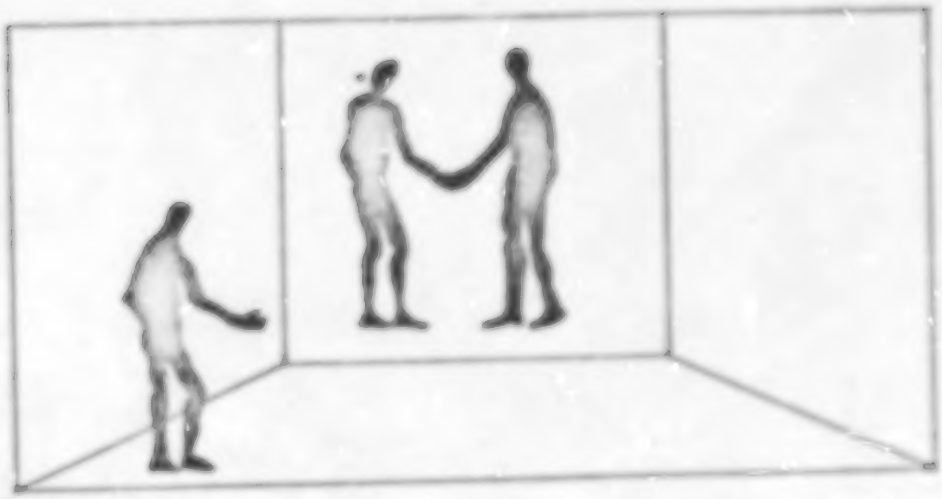


Figure 5 Video Place can give a Perception of being Together

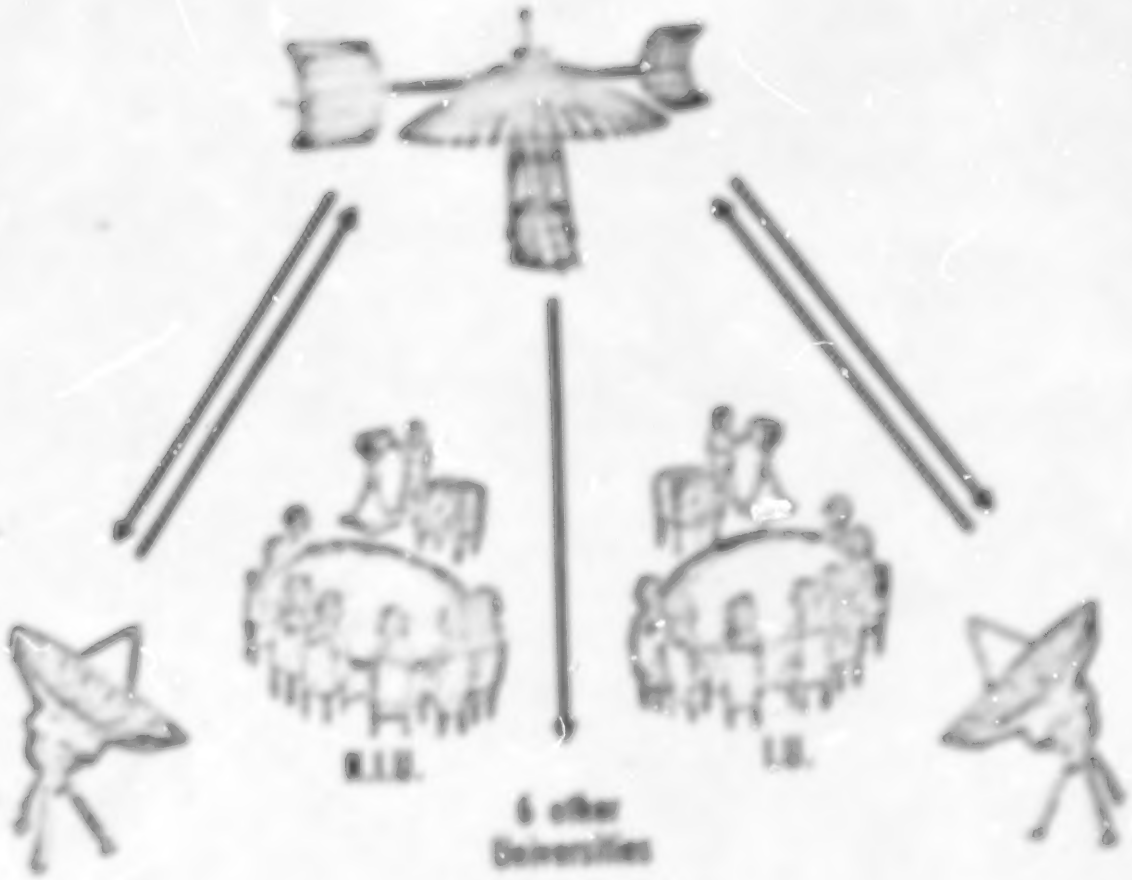


Figure 4 [illegible]

some practical proposals for use of simulations in [illegible] classrooms. Whenever is processes of which should be learned or to think of you who are only here [illegible] learning. I'm sure Northern Lights educators will [illegible] to them.

I don't know what variations to expect but I'm working on some great ideas from this group. You may have a competitive advantage over a few educators who are more knowledgeable on the technology but are afraid to change. The educational ideas incorporated into the Alive! programs, which I understand, are not immediately outmoded/dating. Unless ideas for implementing are more than routine they are worth the [illegible] even if the hardware does. I'm suggesting that as practitioners and graduate students you think on some level to creative thought. Don't let anyone in your group say, "It can't be done."

After we go over a few of the ideas coming out of your groups I'll turn to premise to the cards and take on questions from the audience.

[illegible]

Ideas for use of ICT/IT coming from graduate students [illegible] seminar at Northern Illinois University:

1. The Live Arts - Plug researchers into a live seminar sequence in the major artsmade performing semesters fields of study. Use the Arts or other data and literature bases to ground and be issue materials prior to and following the live seminar.

2. Replace all "dead" symbols (audio visual center, duplication equipment, ETV's, etc.) with a network mesh system like satellites) that cover the whole

3. Coordinate the artsmade specialties where neither research nor teaching facilities should be duplicated or more than a handful of institutions. Then have this limited number very good material Form into satellite ties to be coordinated with a small number of learners. This large group will get the gains of the specialty before inquiries but a final period of study at these institutions after the contacts.

4. In selected fields with scarce resources, offer special courses across the footprint. Example: a professor lectures, [illegible] and makes arrangements to use cameras so that she can see. This can be live or tape. Then he contracts the [illegible] class discussions with each of the two at a time-on. This could be the professor's full teaching load and only "master teachers" would be selected for this.

5. Sell the satellite footprint primarily, [illegible] primary purposes, i.e., [illegible], Alive, multi-cultural research exchanges. Use services at very special fields such as medical recognition where surgical operations are shared, special diagnoses, medical school conferences and all specialties to exercise and practice in this field. The same can be developed in law, business and special areas of education. Interactive education will take highest priority over the footprint. Footprint if there become the key staff development and in-service arts for the professions in the area. Continuing education units as used to some professions could be "earned" "banked" and on other not work.

6. Special vocational training from on site [illegible] settings. In more remote and less developed areas, it may be necessary to duplicate for [illegible] to vocational schools. Vocational programs should involve the vocational teaching ability [illegible] to want to make up with the receiving hardware services to on the footprint and to whatever site is [illegible] vocational schools or bases are available for [illegible] further use.

7. Develop a research reporting system that reduces to two steps. For students, students on the particular area where research, small research, small learners, [illegible] may use outside from the core learners, are available and for networking on any research research step to plan some small projects from 1 to 3 hours. Each of them to research reporting will be fit/made to [illegible] type printouts of background and new material to [illegible].

Suggestions for specifics use in pre-K and higher education coming from the small-triangle conferences in Durham, Wisconsin:

1. In-service and practica courses. Useful for faculty to develop if they want to use a course, [illegible] and for students to develop if they want to take it [illegible].

2. Set up a lecture format with periodic [illegible] classes questions developed by students through a [illegible] format. The students would be supplemented by a small [illegible] seminar, and if the students assembled [illegible] to be [illegible]ing, and more human lecture quality [illegible] be shown. [illegible] - courses - courses [illegible] - [illegible] - lectures - [illegible] - [illegible] - [illegible]